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POLLUTION OF THE INTERSTATE WATERS OF THE GRAND CALUMET RIVER, LITTLE CALUMET RIVER, CALUMET RIVER, WOLF LAKE, LAKE MICHIGAN AND THEIR TRIBUTARIES. PROCEEDINGS OF CONFERENCE HELD AT CHICAGO, ILLINOIS ON MARCH 2-9, 1965.

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UNITED STATES DEPARTMENT
OF
HEALTH, EDUCATION, AND WELFARE

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Conference in the matter of pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and their tributaries (Indiana-Illinois).

****

MR. MURRAY STEIN, Chairman

****

McCormick Place
Banquet Room
9:45 o'clock a.m.
March 2, 1965
Chicago, Illinois

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CONFEREES:

MR. H. W. POSTON,

Department of Health, Education, and Welfare,
U. S. Public Health Service, Division of
Water Supply & Pollution Control,
Regional Program Director, Illinois

MR. BLUCHER A. POOLE, Technical Secretary, and
MR. PERRY MILLER,

Stream Pollution Control Board,
State Board of Health, Indiana.

MR. CLARENCE W. KLASSEN, Technical Secretary, and
MR. RICHARD NELLE,

State Sanitary Water Board, Department
of Public Health, Illinois.

MR. FRANK W. CHESROW, President, and
MR. GEORGE A. LANE,

The Metropolitan Sanitary District
of Greater Chicago, Illinois.

Any slides and charts referred to, but not inserted in the record, are on file at the United States Public Health Service, Department of Health, Education, and Welfare, Washington, D.C.

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CHAIRMAN STEIN: The conference is open.

This conference in the matter of pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and their tributaries, involving the States of Indiana and Illinois, and the Department of Health, Education, and Welfare, is being held under the provisions of Section 8 of the Federal Water Pollution Control Act.

The purpose of the conference is to bring together the State water pollution control agencies, representatives of the Department of Healtn, Education, and Welfare, and other interested parties to review the existing situation, to appraise what progress has been made, to lay a basis for future action, and to give the States, localities, and industries an opportunity to take any remedial action which may be indicated under State and local law.

The conference technique is rather an old one. It is used informally by many State agencies in the normal conduct of their business in the field of water pollution control. The conference system was proposed by the United States Supreme Court as long ago as 1921 in the famous case of New York versus New Jersey involving interstate pollution. I would like to quote from this decision:

> "We cannot withhold the suggestion, inspired by the consideration of this case, that the grave problem of sewage disposal by the large and growing population living on the shores of New York Bay is one more readily to be most wisely solved by cooperative study and by conference and mutual concession on the part of representatives of the States so vitally interested in it than by proceedings in any court however constituted."

And I don't think we have to emphasize for the people of Chicago and Indiana and the lake states the aptness of that quote from the Supreme Court.

We strongly support the conference technique and we consider as successes those problems which are solved at the conference table, rather than in court.

As specified in Section 8 of the Federal Water Pollution Control Act, the Secretary of Health, Education, and Welfare has notified the official State water pollution control agencies of this conference. These agencies are the Indiana Stream Pollution Control Board and the Illinois State Sanitary Water Board.

Indiana will be represented by Mr. Blucher Poole, accompanied by Mr. Perry Miller. Illinois will be represented by Mr. Clarence Klassen, accompanied by Mr. Richard Nelle of the State Sanitary Water Board; and Colonel Frank Chesrow, accompanied by Mr. Lane of the Metropolitan Sanitary District of Greater Chicago.

Mr. Lane, I'm happy to see that we have another lawyer up here; we're surrounded by engineers and others.

Mr. H. W. Poston of the Chicago regional office of the Department of Health, Education, and Welfare, the Regional Program Director for the water pollution control program, has been designated as conferee for the Federal Government.

My name is Murray Stein. I am from Washington, D.C., headquarters of the Department of Health, Education, and Welfare, and am the representative of Secretary of Health, Education, and Welfare, Anthony J. Celebrezze.

The conferees are privileged to invite whomever they wish to participate in these proceedings.

Both the States and the Federal Government have responsibilities in dealing with interstate water pollution control problems. The Federal Water Pollution Control Act declares that the States have primary rights and responsibilities for taking action to abate and control interstate pollution, and it has always been the policy of the Department of

Health, Education, and Welfare to give full recognition to this traditional role of the States, and to encourage them in these activities.

At the same time, the Department of Health, Education, and Welfare is charged by law with its own specific responsibilities in connection with interstate pollution control problems.

The Secretary of Health, Education, and Welfare is required to call a conference such as this when, on the basis of reports, surveys, or studies, he has reason to believe that pollution subject to abatement under the Federal Water Pollution Control Act is occurring. The Act provides that pollution of interstate waters, which endangers the health or welfare of persons in a State other than that in which the discharges originate, is subject to abatement.

The conference will be useful, we hope, in providing a clear picture of the problem, in delineating the progress which has already been accomplished, and in indicating what needs to be done to correct the problem in these interstate waters.

All the conferees will be called upon to make statements. The conferees, in addition, may call upon participants whom they have invited to the conference to make statements. At the conclusion of such statements, the conferees will be given an opportunity to comment or ask questions, and at the conclusion of the conferees' comments or questions, I may ask a question or two. This procedure has in the past proven effective in reaching equitable solutions.

At the end of all the statements, we will have a discussion among the conferees and try to arrive at a basis of agreement on the facts of the situation. Then we will attempt to summarize the conference orally, giving the conferees, of course, the right to amend or modify the summary.

Under the Federal law, the Secretary is required at the conclusion of the conference to send a summary of it to all the conferees. The summary, according to law, must cover the following points:

1. Occurrence of pollution of interstate waters subject to abatement under the Federal Act;
2. Adequacy of measures taken toward abatement of pollution; and
3. Nature of delays, if any, being encountered in abating the pollution.

The Secretary is also required to make recommendations for remedial action if such recommendations are indicated.

Now, a word about the procedure

governing the record of the conference. A verbatim transcript of the conference is being made for the purposes of aiding us in preparing a summary and of providing a complete record of what is said and done here.

We will make copies of the summary and transcript available to the official water pollution control agencies of Indiana and Illinois.

We have found that, generally, it is best that people should request transcripts through their State agency, rather than come directly to the Federal Government. The reason for this is that we would prefer the people who are interested in the problem to follow their normal relations in dealing with State agencie rather than the Federal Government on these matters when the conference has been concluded.

We will be most happy to make this material available to the States for distribution.

I would suggest that all speakers and participants other than the conferees making statements come to the lectern and identify themselves for purposes of the record.

At this point, we are indeed privileged to be able to present Mayor Richard Daley of the City of Chicago.

Mayor Daley.

(Applause.)

MAYOR DALEY: Thank you very much, Chairman Murray Stein.

Mr. Poole, Frank Chesrow, Clarence Klassen, ladies and gentlemen, as Mayor of Chicago, I wish to welcome all of the people who are participating here today.

The problem of water pollution is of the deepest concern to all of our citizens, regardless of wherever they may live, regardless of their economic status.

This meeting in which we are all participating can be a tremendous first step in initiating a program that will do much to abate the pollution of our most precious resource.

I wish to express my appreciation to the United States Department of Health, Education, and Welfare, Public Health Service, for this opportunity to testify on this critical issue of water pollution control and abatement.

Present here today are public officials and engineers from the city who will testify and will be happy to answer any questions.

In September of 1963, we testified before

Mayor Daley.

(Applause.)

MAYOR DALEY: Thank you very much, Chairman Murray Stein.

Mr. Poole, Frank Chesrow, Clarence Klassen, ladies and gentlemen, as Mayor of Chicago, I wish to welcome all of the people who are participating here today.

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Present here today are public officials and engineers from the city who will testify and will be happy to answer any questions.

In September of 1963, we testified before the House Subcommittee on Natural Resources and Power on the identical subject matter we are addressing ourselves to here today.

I stated then it was our general philosophy to try to solve our local problems of lake pollution originating from our own and neighboring communities and industries by active and friendly cooperative efforts with them as well as with the state health agencies in Illinois and Indiana.

I still believe that we should explore every avenue of cooperation, but the publication since then of the report by the Division of Water Supply and Pollution Control has made it apparent that cooperation alone is not sufficient to meet the critical threat to Lake Michigan and other bodies of water supply and recreation.

I will leave it to the engineers and technicians to discuss the scientific results of the survey, but the conclusion of this report is inescapable.

That conclusion is that at present there exists a greater amount of pollution than should be permitted -- that the pollution is on the increase -- and is showing definite signs of causing degradation of the lake.

The problem of water pollution has always been with us. Its emergence as a definite threat to the health and welfare of our people has risen from the urbanization of our area -- the increase of population -- the expansion of industry -- and the development of new products which may bring new and unknown pollutants.

History will show that Chicago has been in the forefront in recognizing that bold and drastic measures are often necessary to solve pollution problems.

Hundreds of millions of dollars have been spent by the citizens of the Chicago area in reversing the flow of the river and establishing a sewage disposal system that is recognized as one of the engineering wonders of the world.

But we have not rested on these accomplishments.

In order to maintain the quality of our water in the last 12 years alone, we have spent $250,000,000 for capital improvements to insure the purity of our water and the adequacy of its use for fire protection for our citizens and industries in 63 suburbs in the metropolitan area.

We appreciate that there have been voluntary efforts made and substantial sums of money spent to meet the threat of water pollution, but the people of this area are now demanding that bold and drastic measures be taken to solve our pollution problems.

Our 1965-1969 five-year water works capital improvement program calls for an additional expenditure of approximately $69,000,000.

I also take pride in the fact that in 1961 a survey to determine the adequacy for fire fighting of the Chicago Water System, made by the National Board of Fire Underwriters, resulted in the water system being graded class one.

Chicago is the only city with a population of over one million to receive this distinction.

The standard of our drinking water has always been considered among the highest in the Nation.

The absolute necessity for maintaining the purity of our water resources is obvious, but is worth repetition.

Of the highest priority, of course, is that the health of our people depends on the purity of our water.

There can be no excuse. We cannot tolerate even a remote possibility that the waters of Lake Michigan shall become defiled and that the life of this living lake be imperiled.

Lake Michigan has not only provided the residents of the metropolitan area with unparalleled recreational facilities, but also to millions of people throughout the Nation and the world.

With the growth of our population and the utilization of land for residential and industrial purposes the recreational facilities we do have must be highly treasured.

We cannot permit any spoilation of this great resource.

Another highly important factor is the aesthetic contribution.

The shore line of Lake Michigan is our front yard and it is considered one of the most fabulous and beautiful front yards in the world.

Unlike any other of our Great Lake cities, you cannot only go swimming in Lake Michigan, but you can breathe air unspoiled by foul odors.

The Federal pollution report has spelled out the pollution problems facing us now and the dangers that are ahead unless prompt control measures are initiated.

I am confident that all of the parties involved -- the states, the counties, local governments, and private industries--will cooperate fully with the Federal Government in meeting the serious challenge that faces all of us.

I pledge the full support and cooperation of the City of Chicago.

In the words of President Johnson:

> "It is true that we have often been careless with our natural bounty. At times we have paid a heavy price for this neglect. But once our people were aroused to the danger, we have acted to preserve our resources for the enrichment of our country and the enjoyment of future generations."

With this, Mr. Chairman and gentlemen of the panel, I thank you again for this opportunity.

As the Chairman had said in his opening remarks, our governments, our states must cooperate because this is a very important problem and it challenges all of us, and with the resources of the Federal Government, the states, the local governments, the health agencies, the lawyers and private industry, we can and we must and we will preserve this great lake for future posterity.

(Applause.)

CHAIRMAN STEIN: Thank you, Mayor Daley, for a comprehensive statement.

I think we can all see why Chicago has preserved its natural resources as much as it has with the tremendous problems that you have in Chicago. And as you well know, this is a jewel of a resource on your lake.

I remember the last time I was at a meeting with the Mayor. It was in Honolulu at the Mayor's Conference -- one at which President Kennedy spoke. Even in Honolulu and in Hawaii we found pollution. I think you should be proud of the City that you have here, with the beaches open and the preservation of the water resources. Because I am not sure that the Hawaiian Islands, with all their publicity and the beautiful pictures, can match your record, especially if given a similar population growth. You have done a magnificent job.

(Applause.)

We would like next to call on Mr. Kyran McGrath who has a statement for Senator Paul Douglas.

Mr. McGrath.

MR. MC GRATH: Thank you, Mr. Stein, members of the conference, the statement of Senator Paul Douglas is as follows:

Mr. Chairman, I shall waste no words in describing the crucial necessity of our having pure water in lower Lake Michigan for household and individual use, and for all forms of recreation and industry.

But it should be mentioned perhaps that thus far Chicago has provided the purest and cheapest drinking water in the country, and that by reversing the flow of the Chicago River, we saved Lake Michigan from being polluted by our wastes.

Through the activated sludge process we have developed the most efficient method of treating household sewage which leaves but a ten percent residual of solid matter. But even this is a high total amount.

In the country, over the years, hard work, imaginative efforts and large sums of money have been expended in the fight against pollution.

The effort here is superb, but it is not enough.

The rate of pollution is aggravated here, as in any metropolitan complex, by population growth, industrial growth, and new technology.

The problem is complicated by the fact that pollution does not recognize political boundaries, and that pollution originating in Indiana can and does do injury in Illinois, and to a much lesser degree, vice versa.

Illinois shares with Indiana this southern tip of Lake Michigan, a vast body of fresh water which is the only one of the Great Lakes lying altogether within the United States.

Our two states also share the Calumet River System.

If the people of Chicago and the Calumet area are to enjoy the fullest benefits of these waters in the years to come, Illinois and Indiana must work together to reduce existing pollution, to improve the quality of the degraded waters, and to keep clean waters clean.

The two states must establish and enforce realistic and effective minimum pollution tolerances.

The conference convened today in Chicago in the matter of the interstate pollution of the waters of the Grand Calumet, the Little Calumet, the Calumet, Lake Michigan, Wolf Lake, and their tributaries brings together representatives of the State of Illinois, the State of Indiana, the City of Chicago, and the Government of the United States to review the state of pollution and the progress made toward its control, to lay a basis for future action by all of those concerned, and to afford the two States and the localities an opportunity to take any remedial action under Federal, State and local laws.

Possibly, we may need new laws.

The Secretary of Health, Education, and Welfare has called this conference under the enforcement authority of the Federal Water Pollution Control Act.

As the activities authorized by that Act are already to our benefit through the Great Lakes-Illinois River Basin comprehensive study undertaken several years ago, I hope that this conference will result in a new resolve and a realistic program for the cleanup of the southern tip of Lake Michigan and the Calumet River System.

The effects of pollution are manifest.

Disagreeable tastes and odors in drinking water, and the need for more expensive and difficult treatment of municipal water supplies in both states are only part of the price of pollution.

The water here is still safe to drink, but further impairment of domestic water supplies cannot be tolerated.

Pollution also greatly reduces the

recreational opportunities in our heavily populated area.

Many waters near Chicago are now unsafe for swimming and other water sports.

The Grand Calumet and the Indiana Harbor Canal are unfit for any recreational use.

Lake Michigan and Wolf Lake must be preserved for this purpose.

Our people should not have to drive for miles on a weekend to avoid dirty beaches or beaches too crowded for enjoyment because not enough of them are safe from pollution.

To many a city dweller, who cannot get away, a posted beach means no swimming at all for his family for the entire summer.

Pollution likewise spoils opportunities for boating, water skiing and fishing.

In some waters there are no fish, in others only rough varieties.

Property values suffer near polluted water.

Not the smallest loss, is the loss of beauty.

If you befoul it, you take something away from the people that cannot be put down in terms of dollars and cents.

But the fact that this cannot be measured should not cause it to be ignored.

Illinois and Indiana municipalities and industry share the responsibility for the degradation of these waters.

Combined sewer overflows, dredging, storage tank and barge spills, lake vessel, barge tow, and pleasure craft wastes inflict local or temporary damages.

Gary, East Chicago, and Hammond in Indiana, and Greater Chicago and Bloom Township in Illinois, are the principal sources of municipal wastes.

The general absence of disinfection, the many small treatment plants discharging into ditches and small streams with little dilution water, and combined sewer overflow are described as the major municipal deficiencies in waste disposal.

The volume of industrial wastes is much heavier.

Steel plants and, to a lesser extent, oil refineries and chemical plants are major sources of waste. The Grand Calumet River and Indiana Harbor Canal are heavily polluted, with the visual effects of the Harbor's discoloration reaching into Lake Michigan.

The Canal and its banks are covered with oil. During rainstorms the overflow from combined storm and sanitary sewers is discharged directly to the streams, contributing raw sewage, bacterial pollution and suspended solids, as well as pollution from any industrial wastes present in the city sewer sytem, to the total pollution load carried by the waterways.

A detailed discussion of pollution sources and effects is the province of the experts. They are described in the recent report by the Department of Health, Education, and Welfare and they are startling and frightening. It is my purpose in highlighting some of them to only underscore the seriousness of the pollution which is the business of this conference and the sense of urgency with which it must be attacked.

Mr. Chairman, I look to your success in this conference.

The Federal Water Pollution Control Act, the law under which you are holding this conference, has been a strong force for the prevention, control and abatement of water pollution in the United States since its enactment in 1956. To make it a more effective instrument, the Senate has passed, and the House of Representatives is expected to consider shortly, a bill to create the Federal Water Pollution Control Administration, to give the Secretary of Health, Education, and Welfare permissive authority to set water quality standards for interstate waters, to increase the dollar limitations on grants for construction of municipal waste treatment works, to give a "bonus" in the amount of a grant for projects in conformity with metropolitan area plans, to authorize a four-year program for the development of new and improved methods of coping with the problem of overflow from combined sewers, and to give statutory expression to a positive national clean water policy. It was my privilege to join Senator Edmund S. Muskie of Maine, and thirty other Senators, in sponsoring the legislation. That Bill, S.4, known as the Water Quality Act of 1965, passed the Senate by a roll call vote of 68 to 8 on January 28.

When it becomes a law, the new Federal Water Pollution Control Administration will provide an administrative tool which will help us deal better with the National water pollution control program for the American people. I have a high regard for the dedicated men and women of the Public Health Service who fight a good fight against disease. But I do not believe that a medically-oriented agency is the appropriate organization for the conduct of an aggressive, sometimes controversial program such as the control of water pollution. Water pollution control is part and parcel of water resources management. That broad concept is not given needed emphasis by the Public Health Service. Nor is the program given the identity and the status which it warrants as one of several divisions in one of several bureaus in the Public Health Service. I foresee a more dynamic National program with the creation of the Federal Water Pollution Control Administration in the Department of Health, Education, and Welfare, a program devoted to curbing water pollution, and I hope that no bureaucratic struggle for power will delay this overdue administrative reform.

Another section of the Water Quality Act to which I want to call attention is that which establishes a research and development program relating to combined sewers. Chicago has exciting plans for the exploration of new and improved methods for controlling the discharges from combined sewers, and I believe the Metropolitan Sanitary District is in a strong position to qualify for a demonstration grant under this new authority. The increase in the dollar limitations on waste treatment works construction grants will give more nearly equitable treatment to the cities of the middle size which have been receiving far less than the thirty percent of project cost which the law otherwise allows. But both the total appropriations authorization for these grants, $100 million a year for the entire Nation, and the dollar ceilings of $600,000 (30% minimum) for a city, or $2.4 million for one project involving a number of cities permit far less assistance in the cities of the country than the huge size of the problem requires. Certainly the great metropolitan areas of the country, such as New York, with its 15 million people and that of Chicago which now includes approximately 7 million, and will shortly include at least 10 million, should not be shackled by the ceiling of $2.4 million in the present bill.

Our problems here cover a multitude of localities and two proud and independent states. But they are also interdependent and each needs the cooperation of the other. We also need the cooperation of the great industries of the area. They are now able to throw off a major portion of the social costs of their industrial wastes upon the general public. I appeal to them to hasten the treatment of their wastes so that they will no longer endanger the public.

Mr. Chairman, one more point. While interstate compacts have been useful in the past, I think we need a more effective weapon against bi-state pollution in the future. The Federal, state and local governments should not be regarded as mutual enemies. Each has a part to play and I hope we can agree on a program whereby we can raise the standards of performance instead of adjusting downwards to the level of the lowest. The states and municipalities should adopt safe and realistic minimum standards of pollution, and then see to it that the individuals, industries, cities, and states adhere to these standards.

As man's genius has taken the bountiful water resources which are the legacy of the people of our area and made them do his will, so man's profligacy has squandered a goodly part of that legacy through gross pollution. Lake Michigan is a magnificent heritage and is vital to both Illinois and Indiana. I hope that 1965 will be the year when the still unspoiled strip of the Indiana Dunes will be set aside for the perpetual education, inspirational and invaluable recreational use of the people. I hope that it will also be the year when the people of Illinois and the people of Indiana join hands to restore the degraded waters of the lake and the Calumet River System for the everlasting benefit of the people.

CHAIRMAN STEIN: Thank you, Mr. McGrath.

Do you have Congressman Rostenkowski's statement, too?

MR. MC GRATH: Yes, I do.

Congressman Rostenkowski was unable to be here today due to pressing legislative matters of the U. S. House of Representatives.

He asked me if I would present his statement for him.

It goes, briefly:

The protection of the valuable water resources of the Chicago area is a matter of immediate concern. I believe this timely conference on the interstate waters of the Calumet River system, Wolf Lake and the southern end of Lake Michigan will be of great help to the City of Chicago in its program to keep the areas' waters clean.

Chicagoans are indeed fortunate to have an abundance of fresh water nearby. The clear, cool waters of Lake Michigan are a constant source of pleasure. Swimmers, water skiers, boaters and fishermen are on the lake in ever-increasing numbers on every sunny summer weekend. Nor can we overlook the sheer beauty of Lake Michigan. Its value to the residents of this area is inestimable.

The recreational uses of Lake Michigan are only a part of its great importance and value. We depend on the clean waters of the lake for the water we drink and use in our homes. The lake supplies the water for all domestic uses for millions of people in the Chicago area.

Preservation of Chicago's water resources is not a luxury, but a necessity. The uses of many streams in this area already have been limited by the effects of pollution. This pollution can be, and must be abated. Further, it is vitally important that we take firm measures to insure that the clean waters of this area remain clean.

It is my belief that the cities and industries of this area, the state agencies and the Department of Health, Education, and Welfare hold clean water as a universal goal, and will be able to work together to preserve and protect our precious water resources.

Mr. Chairman, thank you.

CHAIRMAN STEIN: Thank you, Mr. McGrath, for that statement.

We also have a statement from Mr. Chesrow now, another former Congressman. You know, you have so many Congressmen from the Chicago area and Illinois who are interested in the problem, that we who work in water pollution control and natural resources have a lot of favorites here, and all of these are really among the most effective Congressmen, and the next one is, too.

Colonel Chesrow.

MR. CHESROW: I have a telegram here from Sidney Yates, a member of Congress.

"Regret cannot be with you at this conference tomorrow because of important legislation pending in Washington.

"Am very much interested in the results of the conference. Please keep me advised.

"Kindest regards, Sidney R. Yates, Member of Congress."

CHAIRMAN STEIN: Thank you, Colonel.

Next, we have a letter from Congressman Robert McClory, just to show this is on a bipartisan basis and that letter is addressed to Mr. Poston.

I will call on Mr. Poston now for Mr. McClory's remarks. Mr. Poston.

MR. POSTON: Thank you, Mr. Stein.

This letter is addressed to me and received yesterday and it reads:

"Dear Mr. Poston:

"It is with regret that I find it impossible to attend the conference which has been scheduled in Chicago, commencing on March 2, 1965. Accordingly, I would be grateful if you would present this letter to the conference.

"As you know from our previous relationships, I have had a special interest in the subject of water pollution and various legislative and administrative control measures involving this subject. Indeed, I regret that my Congressional duties are such that my presence will be required in Washington, rendering it impossible for me to attend, in person, the interesting and important conference about to get under way.

"I, of course, had occasion to study in detail the report submitted by your Division of Water Supply and Pollution Control to the Subcommittee on Natural Resources and Power (the Jones Committee) at the hearings conducted in Chicago in August, 1963. In addition, I have noted your more recent report of February 1965, which provides a basis of information for the conference, itself. Many other sources of information have come to my attention establishing that many conditions of pollution and threats of pollution exist in the areas in which the conference is primarily concerned.

"The problems confronting the conferees are complicated by the multiple uses to which the waters of Lake Michigan (primarily)must be put. It would seem important to recognize that these various domestic, recreational, industrial and other appropriate uses of this great body of water are legitimate and necessary. I would hope, however, that at no time will it be necessary for Lake Michigan to receive the treated effluent of the Metropolitan Sanitary District.

"I am confident that the purpose of the conference procedures will be fulfilled if the conferees (1) identify the principal sources and trends of pollution in the area and (2) develop practical and positive schedules for reduction of pollution in these vital waters of Lake Michigan and the related rivers and streams.

"The existing Federal legislation and its administration by the Public Health Service, coupled with the substantial provisions of the Illinois Statutes (with which I am familiar), and the Indiana Statutes (with which I must confess an unfamiliarity), as well as the great financial capacity of the states, communities and industries involved, should be adequate for correcting conditions which will be found to exist. There is certainly, within this great and wealthy metropolitan area, adequate state, local and private resources to provide the necessary treatment and disposal of the various municipal and industrial wastes to the end that a high quality of water in Lake Michigan may be preserved and that the quality of the various other waters may be enhanced.

"In connection with arriving at satisfactory solutions, it would seem extremely worthwhile to explore fully the desirability of an adequate interstate compact in which the States of Illinois, Indiana, Michigan and Wisconsin might all be joined. This suggestion is in line with the Congressional admonition contained in the 1961 Federal Water Pollution Control Act.

"I am hoping that the conference will also give adequate attention to pollution and threats of pollution from septic systems, including their effects upon both surface and underground water sources.

"The substantial progress which has been made in recent years in reducing pollution in this area, resulting particularly from the development of municipal and industrial waste treatment facilities, should not deter the conferees from recommending accelerated programs having in mind existing practical and financial considerations.

"In conclusion, may I reemphasize the importance of coordinated action in which local, state and Federal agencies join in an overall spirit of cooperation and respect to the end that all of these interests, as well as the broader public interest, may be well served.

"Sincerely yours, Robert Mc Clory, Member of Congress."

CHAIRMAN STEIN: Thank you, Mr. Poston.

The Governor of Indiana, Mr. Roger Brannigan, regrets he cannot be here because of the press of legislative duties at home, and we have the same sincere regrets from Otto Kerner of Illinois. However, in Governor Kerner's place, we will now hear from Dr. Franklin Yoder, the Health Officer of the State of Illinois. Dr. Yoder.

DR. YODER: Mr. Stein, fellow conferees, distinguished guests, ladies and gentlemen. I also understand that we have a very fine representation here from various citizen groups.

I heard somebody mention the League of Women Voters are here. I think this is excellent.

In view of Mayor Daley's forthright

statement, I will abridge my remarks to a certain extent because I do not want to duplicate anyone's comments.

I would like, however, to say that in the beginning I am going to quote from Justice Oliver Wendell Holmes when he said, "A river" -- and I insert "or a fresh water lake" -- is more than an amenity. It is a treasure. It offers the necessity of life that must be rationed wisely among those who have power over it."

This was in a 1931 decision involving the Delaware River. They may be even more meaningful and appropriate to us today as we convene for this important conference.

Unlike the pioneering days, this portion of Lake Michigan with its surrounding streams and rivers must now serve many complex purposes essential to living. All too often, we lose sight of these essential multipurpose uses of water which include: sources of vital domestic water supply, an abundant source of protein food, a vehicle for commercial transportation, an expanding recreational facility, necessary irrigation for crops and drink for livestock, power for the wheels of industry, as well as the necessary raw material for industrial use.

In fact, the very existence, to say nothing of the expansion, of our industrial economy depends upon this raw material. For in a modern community, we rely on water to absorb and transport waste products from our very municipal and industrial doorsteps.

Despite the man-made municipal and state boundaries, this area has been pre-eminently constituted by nature into a community. Whether our allegiance is to Indiana, Illinois, Chicago or East Chicago, we, nevertheless, live in this community where both the human and industrial health and progress is mutually affected by the degree of the purity of the water.

From a geological point of view, the Great Lakes area is relatively young, but we are old beyond our years in regard to the use of the Lake Michigan water resources. Obviously, there is general agreement and acceptance of the premise that we can no longer afford to continue to waste this resource, but concerning the methods of its conservation and its priority of use, there is a wide disagreement and divergence of opinion. While many of these problems are relatively old politically, technically, and legally, the awareness of the public to them is new.

The current water resources problem in this area is that of maintaining the quality of our new and used water, suitable for reuse. We cannot afford to restrict the municipal and industrial growth of this area with the concept that we are running out of suitable water. We cannot afford to use water once and then discard it unless it is discharged suitable for use again for the many purposes it is now intended. A supply of water adequate in quantity and satisfactory in quality for all future domestic and industrial uses for this area might be considered a health officer's dream. I am advised that this is something which can be accomplished through engineering technology. However, it may not become a reality for reasons which have little relation to technology or public health. It may be a question of money. A clash of local interest may be an obstacle.

The necessary water development may remain in the "dream stage" because of legal considerations and political differences. Technical considerations are based upon real, ascertainable factors. Political, legal and governmental considerations may involve inconsistent and uncertain factors. Public opinion often becuase of the lack of knowledge and appreciation of the value and use of water may assume unpredictable proportions. These uncertainties may through knowledge, understanding, and appreciation, change from the politically impossible or the economically unfeasible to the possible. Often the urgent need for coordinated public action becomes apparent when the seriousness of the problem and feasible solutions are explained and considered. It is my hope that this conference will stimulate such understanding and promote such appreciation of water use.

In closing then, it is recognized that water occupies an unparalleled place in the personal and economic life of this area. As a resource, water is a requirement so basic to our very existence that all other resources are either dependent upon a plentiful supply of clean water, or, in its absence, other resources are valueless for use and development. While many of our national resources vanish with use, the use of water merely produces changes in its position, quality and quantity. Viewing the area involved in this conference as a community, one with mutual health and economic interests, I can best conclude by paraphrasing the words of an industrialist when he recently said, "Cooperation is not a mere sentiment, but in this area, a public health and economic necessity." With the population and industrial growth predicted for this area, all of us should help translate this cooperation into action -- for "in today walks tomorrow." Thank you.

CHAIRMAN STEIN: Thank you, Dr. Yoder.

Now, we will turn to Mr. Poston for the formal presentation. Mr. Poston.

MR. POSTON: Thank you, Mr. Stein.

Mr. Chairman, conferees, ladies and gentlemen, my name is H. W. Poston, and I am the Federal Conferee for purposes of this conference.

Normally, I direct the Water Supply & Pollution Control activities of the Public Health Service in the States of Illinois, Indiana, Ohio, Michigan and Wisconsin.

Today, water pollution control is one of our most pressing social and economic problems. It involves the public health, water management, conservation and just plain aesthetics.

Water pollution has been with us a long time and will be a lot longer unless we take a more concerted action.

President Johnson has shown continued interest and concern for pollution of our Nation's waters. In his message on natural beauty, he asked for stepped up enforcement authority. He said that the Federal Government must be able to prevent pollution before it happens and be able to prevent this pollution at the very source rather than waiting until the pollution is in the streams.

He called every major river basin in America polluted and he stressed industrial pollution. He called for stepped up enforcement or stepped-up effort to abate pollution from Federal installations.

This is three per cent of our National pollution load.

The need for increased research on pesticides was emphasized. All in all, the message calls for a bigger and a better and a more aggressive Federal water pollution control program.

It specifically instructs the Secretary of the Department of Health, Education, and Welfare to undertake an intensive program to clean up the Nation's most polluted streams.

Congress has recognized the water pollution control problem.

In September of 1963, a hearing was held in Chicago by a House Subcommittee on Government Operations. A report on these hearings entitled "Water Pollution Control and Abatement in the Chicago Area, Lower Lake Michigan," has just been released, and it is available in the rear of the room. This is a copy of it.

This report gives the views of many interests in the area and it is most complete.

We from the Department of Health, Education, and Welfare are here because of our enforcement responsibilities under the Federal Water Pollution Control Act; but in addition to the specific responsibilities in connection with enforcement, this Act provides many tools for a mutually broad attack on the water pollution control problem to supplement the very significant efforts that have been put forth by the states.

For example, this law authorizes development of comprehensive plans for utilizing the water resources of our river basins.

It authorizes funds for research to develop new and better methods for waste treatment.

It authorizes financial assistance to state water pollution control agencies and municipalities to strengthen their water pollution control programs.

The Public Health Service has long been interested in the Chicago area. It was in the summer of 1924 that the Trustees of the Sanitary District of Chicago, the Commissioner of Health of the City of Chicago and the Director of the Health Department of the State of Illinois and the Commissioner of Health of the State of Indiana jointly requested the Surgeon General of the Public Health Service to cooperate with them in a study of the sewage pollution of Lake Michigan in that area adjacent to the so-called Calumet District lying partly in Illinois and partly in Indiana.

This study was reported on in 1927 after two years of field investigations.

In 1960, the Public Health Service started a comprehensive study of the Great Lakes-Illinois River Basin. This is the biggest and the most thorough. investigation ever undertaken on water quality in the country.

The greatest part of the activities of the Great Lakes-Illinois River Basin project to this date have been on the Illinois River Basin in Lake Michigan.

The purposes of the study, extensive laboratory facilities have been developed to carry out the extensive analytical procedure.

Technical personnel have been put to work looking into all facets of water quality in this area.

Automatic monitoring equipment has been used for continuous surveillance of streams and lake conditions.

Meters have been developed for determining the direction and velocity of currents in the lake. Special studies have been made in an attempt to find the cause for the death of loons and gulls in Lake Michigan.

A special technical committee, representative of wide variety of water uses was formed to advise with the project on matters of long range program development.

Our report today is a result of many studies and from information and the work of many people; Federal, state and local agencies.

I think for this presentation of this report, it is especially appropriate to have Mr. Maurice Le Bosquet, one of our senior engineers make the presentation. It is appropriate because he is a native Chicagoan. He went to Parker High School and graduated from the University of Illinois and he worked with the Illinois Health Department making surveys of industrial wastes in the Calumet area.

He also worked with Greeley and Hansen, consulting engineers here in Chicago.

In addition to his deep seated interest in Chicago and the broad experience with the Public Health Service, he is an engineer of international authority, having been advisor to the Governments of the Belgium Congo and India.

At mid-month, he will go to Peru for the World Bank as a consultant on health and sanitation matters.

Mr. Le Bosquet has also been an advisor to our Great Lakes project. I'd like to present Mr.

Le Bosquet.

MR. LE BOSQUET: Thank you, Mr. Poston.

Mr. Chairman, conferees, ladies and gentlemen, on the basis of reports, surveys or studies, in accordance with Section 8 of the Federal Water Pollution Control Act, Secretary Anthony J. Celebrezze, of the Department of Health, Education, and Welfare, on December 15, 1965, called a conference in the matter of pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and their tributaries.

This presentation is a summary of the technical report on interstate pollution problems in the Calumet area of Indiana and Illinois.

I would ask at this time that the complete report be placed in the record and I will summarize.

CHAIRMAN STEIN: Without objection, that will be done.

REPORT ON
POLLUTION OF THE WATERS OF THE GRAND CALUMET RIVER, LITTLE CALUMET RIVER, CALUMET RIVER, LAKE MICHIGAN, WOLF LAKE AND THEIR TRIBUTARIES

ILLINOIS - INDIANA

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
Division of Water Supply and Pollution Control
Region V
Chicago, Illinois

February, 1965

I - SUMMARY AND CONCLUSIONS

On the basis of reports, surveys, or studies, in accordance with section 8 of the Federal Water Pollution Control Act (33 U.S.C. 466 et seq.) Secretary Anthony J. Celebrezze of the Department of Health, Education, and Welfare, on December 15, 1964, called a conference in the matter of pollution of the interstate waters of the Grand Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and their tributaries (Indiana-Illinois).

The Calumet Area at the south end of Lake Michigan in Illinois and Indiana includes the Calumet River system and the affected waters of Lake Michigan. Although poorly drained, it lies astride a continental divide, with about 40 percent of the area draining to the Illinois River thence to the Mississippi River, and about 60 percent of the area draining to Lake Michigan and the St. Lawrence River. Most of the streams and ditches are sluggish or stagnant, and some of the streams, particularly the Calumet River in Chicago, experience alternating directions of flow.

The western parts of the Little Calumet and Grand Calumet Rivers flow from Indiana into Illinois. Wolf Lake is an interstate lake lying on the Illinois-Indiana state line. The state line extends northward from the shoreline into Lake Michigan, passing within one-third mile of the mouth of the Calumet River in Chicago, and turns east at a point about 1½ miles north of the Calumet Harbor breakwater.

The currents in Lake Michigan are also subject to reversal of flow. Under most conditions the direction of flow is from Indiana waters to Illinois waters, but flow from Illinois to Indiana waters is also common.

The area is highly industrialized, and the industries are expanding production rapidly. There are ten major steel mills, five petroleum refineries, and several chemical, paper, and food processing industries in the area.

Lake Michigan is used as a source of municipal water supply. The City of Chicago pumps about 1040 million gallons daily (mgd) and serves a population of about 4,400,000. The cities of Gary, Hammond, East Chicago, and Whiting in Indiana pump about 62 mgd and serve a population of about 375,000. Lake Michigan is also used as the major source of industrial process and cooling water in the area, and as a source of condenser water for power plants. Lake Michigan and its harbors in the area handle about 60 million tons of cargo annually, of which three-fourths is iron ore and related materials for the steel industry.

Lake Michigan and Wolf Lake are heavily used for recreational activities such as swimming, boating, water skiing, and fishing. They also receive direct discharges of industrial wastes.

The Grand Calumet River is used to a minor extent as an industrial water source. Its main use is as a receiver of municipal and industrial wastes. The Indiana Harbor Canal is used extensively for navigation and as a receiver of industrial wastes. The waters of the Grand Calumet River and the Indiana Harbor Canal are unfit for any recreational activity.

The Calumet River and the navigable portion of the Little Calumet River are used for navigation, industrial water supplies, receipt of municipal and industrial wastes, and recreational boating. A large number of parks, golf courses, and forestpreserves are located along the banks of the Little Calumet River. The Cook County Forest Preserve District has not developed picnic areas along the Little Calumet River because of its polluted condition.

Municipal sewage and industrial wastes, treated to varying degrees, are the principal pollutional materials discharged continuously into the waters of the Calumet Area. Other wastes discharged intermittently may have serious local effects or may cause temporary excessive pollution. Among these wastes are accidental spills from storage tanks and barges, combined sewer overflows, wastes from lake vessels, barge tows, and pleasure craft, and materials from dredging operations.

The total oxygen demend of municipal and industrial waste as discharged in the Calumet Area is about 1,150,000 population equivalent (PE) of which 80 percent is discharged in the Lake Michigan Basin and 20 percent is discharged in the Illinois River Basin. Seventy percent of the waste discharged in the Illinois River is from municipal sources and 30 percent is from industrial sources. In contrast, only 5 percent of the waste discharged in the Lake Michigan Basin is from municipal sources, and 95 percent is from industrial sources.

The principal deficiencies in municipal waste disposal in the Calumet Area are the general lack of effluent disinfection, the prevalence of combined sewer systems that cause the discharge of untreated sewage during and after heavy rains, and the proliferation of small sewage treatment plants throughout the basin that discharge to ditches and small streams. These plants are so numerous, and the amount of dilution water so small, that nearly all streams are to some extent polluted.

Three steel plants that discharge wastes to the Grand Calumet River and the Indiana Harbor Canal are the most significant sources of wastes in the Lake Michigan Basin. Oil refineries and chemical plants are lesser, but still major, sources of wastes. The steel plants discharge coking wastes, blast furnace wastes, and rolling mill wastes. The chief identifiable constituents in these discharges are oxygen-demanding wastes, oily wastes, waste pickle liquor, phenolic materials, ammonia, cyanide, and suspended solids. The refineries discharge oxygen-demanding wastes, oily wastes, phenolic materials, and ammonia.

The steel plants in the Illinois River Basin have their coking wastes sewered and treated at the Calumet Plant of the Metropolitan Sanitary District of Greater Chicago. The principal wastes discharged to the rivers from these plants are oily wastes, waste pickle liquor, and suspended solids. One steel plant discharges untreated sewage to the Little Calumet River in Illinois.

Biological studies (1961-63) indicate that all of the streams in the Calumet Area are polluted, differing only in degree and by nature of the pollutant. The Grand Calumet River is the worst of all as evidenced by the near-absence of bottom organisms. The Little Calumet River is and Calumet Rivers and the Indiana Harbor Canal are also severely degraded.

Streams in the Calumet Area are generally characterized by unsightly appearance, in the form of floating debris, oil, discoloration, and turbidity. Channel banks, structures, and boats acquire a black coating from oil or tarry substances. Malodorous conditions are prevalent and frequent. Along the shores of Lake Michigan, in Indiana and the southern shore in Illinois, the Lake waters are discolored by suspended and dissolved waste materials, in sharp contrast to the pleasing appearance of the rest of Lake Michigan.

The streams of the Calumet Area are grossly polluted by fecal contamination. Average coliform densities on the Grand Calumet and Little Calumet Rivers where they cross the State line were in the order of 1 million per 100 ml, and average fecal streptococcus densities were 70,000 to 80,000 per 100 ml. Burns Ditch showed 120,000 coliform per 100 ml near Lake Michigan, and 1.7 million four miles inland. In the Indiana Harbor Canal coliform counts averaged 380,000 per 100 ml, and individual tests ranged up to 2.5 million. The Calumet River exhibited average coliform densities of 2,900 per 100 ml about three miles farther inland. Periodic reversals of flow in the Calumet River can contribute bacterial pollution in Lake Michigan. Bacterial pollution of the magnitudes indicated in Calumet Area Streams constitutes a threat to public health.

Critically-low dissolved oxygen concentrations exist generally throughout the streams of the Calumet Area. Nearly every sampling station showed zero dissolved oxygen at some time during field investigations.

The bottom of Lake Michigan in the Calumet and Chicago areas exhibits biological degradation caused by organic enrichment. Whereas in the clean bottom areas of Lake Michigan there are many kinds of organisms, with none predominating, this area exhibits only a few kinds. Sludge-worms and aquatic scuds are the most numerous, but bloodworms and fingernail clams are sometimes abundant. Of these, only the scud is sensitive to pollution. The number of pollution-tolerant organisms average 250 to 400 per square foot in the Calumet Area, and increase to 1000 per square foot off Chicago. The lesser numbers in the Calumet Area reflect inhibition by heavy settleable solids and toxic materials, whereas the less dense organic materials are carried by lake currents northward to the waters off Chicago. The kinds of organisms found in this area of Lake Michigan limit the species of desirable fish such as whitefish, lake trout, and yellow perch, and favor trash fish such as carp, buffalo, and suckers.

The deep waters of Lake Michigan generally contain less than one coliform organism per 100 ml. In contrast, the inshore waters of Lake Michigan in the Calumet Area often contain several thousand coliform organisms per 100 ml, indicating fecal contamination from the tributary area. Bathing beaches at Whiting, Hammond, and Chicago's Calumet Park, which lie between Indiana Harbor and the Calumet River, nearly always exhibit coliform densities greater than 1000 per 100 ml. Coliform densities greater than 10,000 are common at these beaches, and densities greater than 100,000 occur often at the Whiting and Hammond beaches.

Taste and odor producing materials, such as phenolic materials, are discharged to Lake Michigan from industries in Indiana, and interfere with municipal water supplies in Indiana and Illinois. It has been demonstrated that severe taste and **odor** problems at Indiana water treatment plants in January and March 1963, followed a few days later by similar problems at Chicago, were associated with lake currents moving northwestward from the Indiana Harbor area toward Chicago. Likewise, large amounts of ammonia discharged to Lake Michigan in Indiana increase the cost and difficulty of municipal water treatment in Indiana and Illinois. In addition, this ammonia contributes to fertilization of Lake Michigan, which can cause prolific growths of algae and aquatic weeds that pile up onto beaches, clog water intakes, and interferes with filter plant operations, and cause taste and odor problems in munipal water supplies.

Section IX of this report discusses corrective measures needed in the Calumet Area.

Although one company discharges industrial wastes into Wolf Lake in Indiana, resulting in pollution of a portion of the lake and causing fish kills, investigation by the Public Health Service has not disclosed significant interstate pollution of Wolf Lake.

There is no evidence of interstate pollution from the discharge of wastes to Lake Michigan via Burns Ditch. Burns Ditch has some effect on the contribution of nutrients in the south end of Lake Michigan, and contributes local bacterial pollution. The effects of increased development in this area bear careful watching.

Sewage and industrial wastes discharged to the Little Calumet River and Grand Calumet River in Indiana cause pollution of these waters in Illinois. Sewage and industrial wastes discharged to the Calumet River System and Lake Michigan in Indiana cause pollution of the waters of Lake Michigan in Illinois, and sewage and discharged industrial wastes to the Calumet River System and Lake Michigan in Illinois cause pollution of Lake Michigan in Indiana. This pollution endangers the health or welfare of persons in a state other than that in which the discharges originate, and therefore is subject to abatement under the provisions of the Federal Water Pollution Control Act.

II - FORWARD

This is a technical report on interstate pollution problems in the Calumet Area, Indiana and Illinois.

The waters under consideration are the Grand Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and their tributaries. Findings are based on data obtained from State, local, and sanitary district records, industries, and sampling by the Public Health Service.

The cooperation provided by the Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board, the Metropolitan Sanitary District of Greater Chicago, and others in supplying valuable information is gratefully acknowledged.

The report considers the quality characteristics of the waters as they exist today, evaluates the effects of waste discharges on the water quality and water uses, and summarizes the principal problems and needed corrections.

III - BACKGROUND

The quality of the waters of Lake Michigan has long been a matter of concern, and there have been diverse opinions on how and to what extent the lake should be protected. In the 19th century the growing city of Chicago experienced increasingly severe outbreaks of cholera and typhoid fever. In 1856 Chicago started construction of the first integrated sewer system in the United States and only the second one in the modern world - Hamburg, Germany having built one before. However, these sewers drained to the rivers and hence to Lake Michigan, and epidemics continued.

The Metropolitan Sanitary District of Greater Chicago (then the Sanitary District of Chicago) was organized in 1890, and its first responsibility was to protect Chicago's water supply from pollution. It constructed the Sanitary and Ship Canal and reversed the flow of the Chicago River in 1900.

The flow of the Calumet River was reversed in 1922, and thus Chicago's sewage was substantially excluded from Lake Michigan and diverted to the Mississippi River drainage basin.

In 1922 a number of Great Lakes States joined to bring suit in the United States Supreme Court to end the existing diversion at Chicago. In 1930 the Court issued a decree directing the Sanitary District to reduce its diversion to 1500 cubic feet per second (cfs), plus domestic pumpage (which now averages 1700-1800 cfs) by the end of 1938. To meet the terms of the decree, the District engaged in a massive construction program designed to provide secondary treatment for its wastes. The building program was substantially completed in 1949. Litigation was resumed in 1959, when the Supreme Court directed the reopening of its 1930 decree. The present party litigants consist of the States of New York, Ohio, Minnesota, Pennsylvania, Michigan and Wisconsin as plaintiffs, the State of Illinois as defendant, and the United States of America as an intervening party litigant.

The State of Illinois, the City of Chicago, and the Sanitary District of Chicago filed suit in the United States Supreme Court in 1944 against the State of Indiana, the Cities of Hammond, Gary, East Chicago, and Whiting, and 16 industries in Indiana, alleging pollution of the south end of Lake Michigan and the impairment of Chicago's water supplies. The case was heard before a Master in Chancery in St. Louis, Missouri, and a consent decree was entered in 1945, whereby certain corrective measures were to be taken. In 1948 the consent decree was deemed to have been complied with.

IV - THE AREA

The area included in this report is the Calumet River System in Indiana and Illinois upstream of the navigation locks at Blue Island, Illinois, the contiguous and directly affected areas of Lake Michigan, north to the Cook-Lake County, Illinois line, and Wolf Lake. Figure IV-1 (P.154) shows the relationship of the Calumet Area to the larger Chicago area drainage pattern, while Figure IV-2 (P.155) shows the relevant Calumet Area in more detail.

The Calumet Area, as defined in this report and shown in Figure IV-2 (P.155), includes roughly 742 square miles, of which 320 square miles are normally tributary to the Illinois River and Mississippi River, and 422 square miles are normally tributary to Lake Michigan and the St. Lawrence River.

Cities and Industries

Some of the major cities in the area are Gary, East Chicago, Whiting, and Hammond, in Indiana; and Calumet City, Chicago Heights, and a part of the south side of Chicago in Illinois. The area is heavily industralized, with five petroleum refineries and ten major steel mills. Some of the major industries in Indiana are the United States Steel Corporation, Gary Works and Gary Sheet and Tin Mill; Youngstown Sheet and Tube Company; Inland Steel Company; Cities Service Petroleum Company; Sinclair Refining Company; Mobil Oil Company; and American Oil Company. Some of the major industries in Illinois are the United States Steel Corporation, South Works, Wisconsin Steel Works, Interlake Iron Corporation, Republic Steel Corporation and Acme Steel Company. As an indication of the magnitude of industrial activity in the area, the value added in manufacture in the Calumet area in the year 1958 was estimated at 2 billion dollars. Industry is growing in this area and present day activity is undoubtedly higher.

Stream System

The Calumet Area is a flat plain with much of the land only slightly above Lake Michigan water levels. In what might be considered their natural state, the Little Calumet and Grand Calumet Rivers originated in Indiana and flowed westward into Illinois where they joined and became simply the Calumet River, which discharged into Lake Michigan. However, the development of the area by man has changed this flow pattern.

In 1922, the Calumet Sag Channel was completed between the Chicago Sanitary and Ship Canal and the Little Calumet River at Blue Island, Illinois. This construction caused the Calumet River, and that portion of the Little Calumet River from Blue Island to the Calumet River, to be reversed and thus flow away from Lake Michigan. However, this is an unstable situation; depending on storm runoff and fluctuating Lake levels, the stream frequently flows toward Lake Michigan.

Burns Ditch was completed in 1923 to connect the eastern part of the Little Calumet River in Indiana to Lake Michigan near Ogden Dunes, Indiana. This construction caused an indefinite division of the flow in the Vicinity of Highland, Indiana, reversing the flow of the Little Calumet River from this point east to Ogden Dunes. All portions of the Little Calumet River east of the new divide then became tributary to Lake Michigan via Burns Ditch.

The Indiana Harbor Canal was completed in East Chicago, Indiana, in 1903. Construction of this canal connected the Grand Calumet River east of this point, now normally tributary to Lake Michigan. The Grand Calumet River from this point west to the area near the East Chicago - Hammond, Indiana city limit has been reversed and now flows to the Lake Michigan via the Indiana Harbor Canal. The point where the division of flow occurs is rather indefinite, and depending upon the local level of Lake Michigan, dredging operations, and rainfall intensity, the actual divide can vary over a distance of several miles. Under normal dry-weather conditions the East Chicago sewage treatment plant effluent flows eastward to the Indiana Harbor Canal and Lake Michigan, while a variable part of the Hammond sewage treatment plant effluent flows westward to the Calumet River.

A temporary dam on the Grand Calumet River at Columbia Avenue in Hammond, Indiana has recently been proposed by the U. S. Corps of Engineers. The purpose of the dam would be to prevent water reaching the Illinois River system from the Grand Calumet River east of that point, when the locks at

Blue Island, Illinois, have been removed. The exact location of the new dam is still subject to study. The Corps of Engineers has proposed two alternate sites for the dam. Site A is just west of the outfall sewer from the Hammond sewage treatment plant and would direct all treated and by-passed sewage from Hammond and East Chicago toward Lake Michigan. Site B is just east of the Hammond outfall sewer and would direct sewage from Hammond to the Calumet River, while sewage from East Chicago would flow to Lake Michigan. The Public Health Service has proposed that the dam be so located that the treated sewage from Hammond and East Chicago, Indiana, will not be directed toward Lake Michigan.

Wolf Lake is located astride the Illinois-Indiana State Line in Chicago and Hammond. The original connecting channel from Wolf Lake to Lake Michigan has been blocked, and a connection to the Calumet River in Chicago has been constructed. The City of Hammond has a much-used park on the east shore of Wolf Lake which occupies most of the Indiana shoreline. The Illinois portion is a part of Wolf Lake Conservation Area.

Flow Reversal in Calumet River

The direction of flow in the Calumet River under normal conditions is from Lake Michigan toward the Calumet-Sag Canal. This flow is induced by the hydraulic control of the Sanitary and Ship Canal system maintained by the Metropolitan Sanitary District in connection with the diversion of water from Lake Michigan for dilution purposes. The Blue Island Controlling Works, owned and operated by the Sanitary District, is one of the points of diversion from Lake Michigan.

The record low stages of Lake Michigan during the past year have contributed to reversals of flow in the Calumet River under two different sets of conditions as explained below.

1. With the present low lake stages and the requirement to maintain a 9-foot navigation depth in the Calumet Sag Channel, the hydraulic head at the Blue Island Controlling Works is minimal, varying from zero to a few tenths of a foot most of the time.

Local variations in the level of Lake Michigan of 0.5 to 1.0 foot due to wind and/or barometric pressure effects are common. These changes occur in a few hours time, and the effect may persist for one or more days.

When the lake drops 0.5 foot or more at Calumet Harbor, this can produce a hydraulic gradient which causes the Calumet River to flow toward the lake for periods ranging from a few hours to more than one day. This may occur even though the lock gates at the Blue Island Controlling Works are fully opened in an effort to induce flow to the Calumet-Sag Channel.

The Metropolitan Sanitary District operates recording water level gages located on the Little Calumet River at the Acme Steel Plant, and on the Calumet River near its mouth. The recorder charts for the period January through March 1964, were examined for periods of flow reversal. On the basis of 12-hour average gage heights obtained by inspection, eight periods of flow reversal were found. The duration of reversal varied from 12 to 36 hours. A detailed examination of these gage records would permit calculation of the percent of time during which flow is towards the lake. Flow reversals could also be correlated with rainfall to determine which reversals were caused by storm runoff.

2. Major storms which produce excessive runoff in the Little Calumet River basin in the past have resulted in occasional flow reversals in the Calumet River. These have been due to the inability of the Calumet-Sag Channel to carry the flood flows away from the area fast enough, or to operation of the Blue Island

Controlling Works for prevention of flood damage in the area west of the Controlling works. The duration of these flow reversals varies greatly, depending on the storm rainfall distribution. It was estimated that the Calumet River flowed into Lake Michigan for about 72 hours during and after the storm of October 9-11, 1954. During the storm of July 12-13, 1957, when flooding became critical in the Calumet-Sag Channel, the lock gates at Blue Island Controlling Works were opened to permit flow out of the canal toward Lake Michigan. The entire Calumet-Little Calumet system flowed into Lake Michigan for several hours.

In September 1961, heavy rains on the 13th and 14th resulted in general flooding which caused the Calumet River to flow into the Lake for several hours.

Flow reversals caused by runoff have recently become more frequent, due in part to the hydraulic conditions produced by the extremely low lake stages. The lack of head at the Blue Island Controlling Works restricts the flow that can be discharged out of the Calumet-Little Calumet system to the Calumet-Sag Channel. Therefore, runoff may more easily produce a gradient causing flow toward Lake Michigan.

When reversals of flow in the Calumet River occur, both municipal and industrial wastes enter Indiana waters of Lake Michigan which lie about 1/3 mile off shore. Corps of Engineers studies of currents in Calumet Harbor show that strong northerly winds produce a strong southeast current through the harbor. This current would carry pollution along the Indiana shoreline.

The Thomas J. O'Brien lock and dam will provide a positive barrier between Lake Michigan and all of the municipal treatment plants and some of the industrial waste sources on the Calumet-Little Calumet system. When the O'Brien lock is put into operation, these wastes will be excluded from the lake, except during infrequent periods of major flooding when the control gates might be opened to alleviate flood damage.

V - WATER USES

Municipal Water Supply

There are six major municipal water systems in Chicago and the adjacent Calumet Area in Indiana which use Lake Michigan as a source of water supply. The largest is the recently constructed Central District Filtration Plant near the center of Chicago. This plant serves a population of about 2,800,000 and pumps an average of about 660 mgd (million gallons daily). The second largest is Chicago's South District Filtration Plant located just north of Calumet Harbor. This plant serves a population of about 1,600,000 and pumps an average of about 380 mgd. The other users are Gary, serving 200,000 people and using 24 mgd; Hammond, serving 112,000 people and using 23 mgd; East Chicago, serving 56,000 people and using 14 mgd; and Whiting, serving 8,000 persons and using 1.5 mgd. The Gary-Hobart Water Company is constructing a new municipal water plant at Ogden Dunes, Indiana, about one mile west of Burns Ditch. This plant will have an initial rated capacity of 16 mgd.

The location of these municipal water supplies is shown in Figure IV-1 (P.154).

Industrial Water Supplies

Nearly all of the independent water supplies in the Calumet Area are surface supplies. The total pumpage (excluding cooling water used by public utilities) is about 2,760 mgd, of which about 2,480 mgd is pumped in the Lake Michigan Basin and about 280 mgd in the Illinois River drainage basin. Table V-1 shows a breakdown of water use by industrial group.

The steel industry used about 2,400

mgd, 87 percent of the total. The petroleum refining industry uses 250 mgd, 9 percent of the total. The remaining 4 percent is used by the paper, food, and chemical industries. Ninety percent of the industrial water pumpage is taken directly from Lake Michigan. The Calumet and Little Calumet Rivers supply the remainder, except for a small amount taken from the Grand Calumet River and the Indiana Harbor Canal.

Waterborne Commerce

The several ports in the Calumet Area are involved in international, interstate, and interport activities and form a large part of Lake Michigan commerce. The Corps of Engineers, U. S. Army, reported that in 1963, over 52 million tons of cargo moved through Gary Harbor, Buffington Harbor, Indiana Harbor, Lake Calumet, Calumet Harbor, and the Calumet River. This accounted for almost one-half of the total Lake Michigan commerce. Three major types of cargo made up 90 percent of the tonnage handled through the Calumet Area ports. Iron ore and related materials for the steel industry accounted for 74 percent of the total. Petroleum products amounted to 10 percent and grain shipments were 6 percent of the total

In general, the harbors listed above

have sufficient depth to accommodate lake vessels and some, but not all, of the ocean-going vessels which enter the Great Lakes via the St. Lawrence Seaway. In addition, a 9-foot depth navigation channel connects the Calumet River with the Illinois Waterway-Mississippi River System, providing water transportation to St. Louis, Minneapolis, Pittsburgh and New Orleans.

Recreation

Recreational activities such as swimming, boating, water skiing and fishing are engaged in by a large segment of the population of the Calumet Area. During the summer, millions of people visit the beaches in Chicago, Gary and Indiana Dunes State Park. Hundreds of pleasure boats can be observed on Lake Michigan and Wolf Lake, and at times there is a virtual parade of boats to and from the marinas and mooring facilities. As the population grows, the need for recreational facilities will expand. The locations of marinas, launching ramps, beaches, and water-oriented parks are shown in Figure V-1 (P. 156).

Lake Michigan and Wolf Lake provide the only swimming waters. The streams are not safe for swimming because of the bacterial pollution. The Lake Michigan beaches at Chicago, Gary, and Whiting are packed on summer weekends, but there is an increasing tendency for people living in the Calumet area to drive to the Indiana Dunes State Park or the Michigan beaches where the water is clearer and the sand is cleaner. The Hammond-owned beach on Wolf Lake is used by thousands of swimmers and sun bathers. The Lake Michigan beach at Hammond has been closed for several years because of high coliform bacteria counts.

The popularity of water skiing has paralleled the growth in pleasure boating. Occasionally water skiers are observed on the Calumet River but the poor quality of the water and heavy boat traffic make it undesirable. The Indiana Harbor Canal and Grand Calumet River are unfit for any recreational activity. None of the other streams of the area is deep enough for motor boating and skiing. Water skiing is a popular sport on both Lake Michigan and Wolf Lake.

In recent years the growth of interest in pleasure boating has increased at a phenomenal rate. Marinas, mooring facilities, and launching ramps are not able to handle peak traffic. There are now 24 such boating facilities in the areas. This number would undoubtedly increase markedly if the sheltered waters of the area were not polluted. The boat registration records of Indiana and Illinois show how popular pleasure boating has become. In the three Indiana counties bordering on Lake Michigan there are 11,000 boats, and in Lake and Cook Counties in Illinois there are 43,000 registered boats. Many of the boaters of the area moor their boats in cleaner waters as far away as Saugatuck and Holland in Michigan. The waters of the Calumet River stain boat hulls with a tar-like substance that is unsightly and difficult to remove.

Most public parks are located near some feature of nature that has strong appeal. Many times the appeal is a lake or a stream. In the Calumet area there are several such parks that provide recreational opportunities for thousands of people. Marquette Park at Gary and Wolf Lake in Hammond are two of the larger parks of the area. Both are located on relatively clean waters. Calumet Park beach in Chicago is also heavily used, but the bacteria content of its waters is higher than desirable, and accumulations of popcorn slag on the beach from steel mills make the beach unattractive to bathers because of its gritty texture. There are a number of other parks and golf courses along the Little Calumet and Grand Calumet Rivers that are less attractive because of unsightly streams. The Cook County Forest Preserve reports they have now adopted a a policy of building lakes and ponds in the interior of the preserves, away from the polluted streams.

Except for Wolf Lake and Burns Ditch, the streams of the Calumet area are not fished because of the severely polluted conditions and consequent absence of fish. Waterfowl avoid the polluted streams, but hundreds of waterfowl can be observed at Wolf Lake during the spring and fall migrations. They also frequent the offshore Lake Michigan.

Esthetics

A body of water that is dirty-looking or foul-smelling is anything but pleasant. It can be particularly repugnant if it meanders through an area where large populations live and work. The Calumet Rivers are like this. Although there are not very many homes on the banks of the streams, they are in view of thousands of people motoring or walking in the area. The Indiana Toll Road parallels seven miles of the Grand Calumet River, and the Chicago Skyway crosses the Calumet River. There are 16 beaches and parks that provide public access to the streams and lakes. The polluted waters at most of these parks detract from the beauty and limit esthetic enjoyment. The value of property adjacent to clean water is significantly higher than similar property having no adjacent water or situated next to polluted water. If the degraded and unsightly waters of the Calumet area were clean, the value of the adjacent properties would rise substantially.

Waste Disposal and Assimilation

Nearly every stream in the Calumet area, and indirectly Lake Michigan, receives municipal waste. Nearly all municipal waste receives secondary treatment. Most of the waste receiving less than secondary treatment is in the process of correction. Most of the treated domestic waste is not disinfected.

Some portions of the Calumet Area receive relatively little industrial waste. The area tributary to Burns Ditch receives industrial wastes near its mouth, and municipal wastes in tributary areas. The non-navigable portion of the Little Calumet River which flows to the Illinois River receives municipal wastes and a relatively small amount of industrial waste. The large amounts of industrial waste are discharged to the Calumet and Grand Calumet Rivers, the navigable portion of the Little Calumet River, Wolf Lake, the Indiana Harbor Canal and Lake Michigan.

VI - SOURCES OF WASTES

Municipal sewage and industrial wastes are the principal pollutional materials discharged continuously into the waters of the Calumet Area. Other wastes, discharged intermittently or regularly, may have serious local effects or may cause temporary excessive pollution. Among these wastes are accidental spills from storage tanks, barges, etc.; combined sewer overflows; wastes from lake vessels, barge tows, and pleasure craft; and materials from dredging operations.

The total oxygen demand of municipal and the industrial waste in the Calumet Area is about 1,150,000 population equivalent (PE) of which 80 percent is discharged in the Lake Michigan Basin and 20 percent is discharged in the Illinois River Basin. Seventy percent of the wastes discharged in the Illinois River Basin is from municipal sources and 30 percent is from industrial sources. In contrast, only 5 percent of the waste discharged in the Lake Michigan Basin is from municipal sources and 95 percent is from industrial sources.

Three industrial plants discharge one-half of the population equivalent in the entire Calumet Area and two thirds of the population equivalent in the Lake Michigan portion of the area. These plants are the United States Steel Corporation in Gary, Indiana, and the Inland Steel Company and the Youngstown Sheet and Tube Company in East Chicago, Indiana.

Municipal Wastes

Sources of municipal wastes in the Lake Michigan portion of the Calumet Area are listed in Table VI-I, and sources in the Illinois River portion are listed in Table VI-2.

All but two of the municipal waste sources draining to Lake Michigan are tributary to Burns Ditch. Each of these 19 sources is relatively small, but they total 43 percent of the municipal wastes to Lake Michigan. At present, many of these sources discharge inadequately treated sewage. Some are in the process of being corrected. For instance, the Merrillville Conservancy District has been organized to serve the Black Oak-Ross area south of Gary, Indiana.

The largest sources of municipal wastes discharged to the Lake Michigan Basin are the sewage treatment plants at Gary and East Chicago, Indiana. These discharge via the Grand Calumet River and the Indiana Harbor Canal. Neither plant accepts significant industrial wastes. Both provide secondary treatment. At the present time Gary has under construction sewers and sewage treatment plant expansions. This construction includes chlorination facilities and is nearing completion. It is understood that the East Chicago plant has chlorination facilities but they are not regularly operated.

The largest sources of municipal wastes discharged to the Illinois River Basin from the Calumet Area are the Calumet Plant of the Metropolitan Sanitary District of Greater Chicago, the Sanitary District of Bloom Township, Illinois and the Hammond Sanitary District, Indiana. All of these plants provide secondary treatment and accept industrial waste. Depending upon runoff conditions and the level of Lake Michigan, a variable portion of the treated waste from Hammond drains to Lake Michigan.

The Hammond Sanitary District has a major sewer and sewage treatment plant expansion project now under construction which is nearing completion. All of the waste from Griffith, Indiana has been connected; part of Munster is connected, and works are under construction to connect all of it. About half of Highland is connected, with the remainder scheduled to be. These connections should eliminate pollution of the Little Calumet River from these sources, except for storm water overflows, and will result in an increased discharge of treated sewage to the Grand Calumet River. The State of Indiana has recommended that the Hammond Sanitary District include chlorination facilities as part of the present construction project.

The Sanitary District of Bloom Township, Illinois serves Park Forest, Chicago Heights, and South Chicago Heights, and a large industrial district in Chicago Heights. The Sanitary District has engaged two firms of consulting engineers to study its problems. Both reports have been received, and actions to implement the recommendations have been taken.

The Calumet Plant of the Metropolitan Sanitary District of Greater Chicago (MSD) is by far the largest sewage treatment plant in the Calumet Area. It discharges 50 percent of the municipal waste in the Illinois River portion, and 40 percent of the municipal waste in the entire Calumet Area. Effluent disinfection is not practiced, and no plans for disinfection have been announced. The Calumet Plant serves the southeast part of Chicago and many suburbs such as Blue Island, Calumet City, Riverdale, and Dolton. It receives and treats domestic and industrial wastes. Of particular significance, it treats coking wastes from the steel plants located along the Calumet River in Chicago so that phenolic and other constituents of these wastes receive secondary treatment.

The MSD operates two small sewage treatment plants in the Calumet Area, each achieving 85 percent or higher biochemical oxygen demand (BOD) removal efficiency. These plants are at East Chicago Heights and Hazel Crest, Illinois. In addition, the MSD supervises through analytical control 19 additional small operations. These small operations show between 80 and 90 percent BOD removal efficiency. Three of these latter small plants will be eliminated within six months and become part of the intercepter system, in accordance with the overall policy of the Sanitary District pertaining to such installations. Chlorination is carried out at all small Metropolitan Sanitary District treatment plants, and a number of the small private plants in the District have begun chlorination.

Except as hereafter noted, all domestic wastes from industries in the Calumet Area either are connected to municipal systems or receive secondary treatment at the site. All industrial sewage treatment plants in Indiana provide chlorination except the Universal Atlas Cement Company, a part of the U. S. Steel Corporation.

Although secondary treatment for organized sewage systems is the rule in the Calumet Area, there are a large number of small sewage treatment plants, septic tanks systems, and tile systems, both in Illinois and Indiana, that discharge to small streams and ditches. These are so numerous, and the amount of dilution water available is so small, that nearly all streams and ditches are to some extent polluted.

Table IV-7 shows the status of Public Health Service Grants for Construction of Municipal Waste Treatment facilities. Total grants of $1,900,210 in Indiana have supported $7,039,000 in eligible construction, while grants of $237,710 in Illinois have supported $795,600 in eligible construction. The Metropolitan Sanitary District of Greater Chicago has not been certified for a construction grant to date by the Illinois Sanitary Water Board.

Combined Sewer Overflows

Most of the older communities in the Calumet Area have combined sewer systems, which convey the dry weather flow to treatment plants, and spill combined flows to the streams or to Lake Michigan during storm periods, either by gravity or by pumping. The overflow of raw sanitary sewage and industrial wastes mixed with storm runoff constitutes a source of pollution of the waterways and of Lake Michigan in the Calumet Area. Although the overflows are intermittent, depending on rainfall, the resultant pollution seriously of the receiving waters.

Combined sanitary sewage overflows contribute gross bacterial pollution, high suspended solids concentrations, and a heavy BOD load. Any industrial wastes present in the municipal sewer system add further to the pollution problem.

Several Indiana communities are served by combined sewers with reported overflows to tributaries of the Calumet River and flow westward into Illinois. Pollution resulting from overflows in these towns has interstate implications:

MUNSTER HAMMOND
GRIFFITH SCHERERVILLE
HIGHLAND

A number of Illinois communities having combined sewers which overflow to the Calumet River system are listed below. Overflows from these towns can go to Lake Michigan during periods of flow reversal in the Calumet River:

CALUMET CITY LANSING
BURNHAM RIVERDALE
SOUTH HOLLAND DOLTON
PHOENIX POSEN
CHICAGO(MSD Calumet Treatment Plant)

Several Indiana communities bined sewers which overflow to the Indiana Harbor Canal-Grand Calumet River system are listed below. Overflows from these towns go to Lake Michigan via the Indiana Harbor Canal:

GARY
EAST CHICAGO
HAMMOND
WHITING

A number of other Indiana towns served by combined sewers which overflow to the Little Calumet Burns Ditch system are listed below. These overflows reach Lake Michigan via Burns Ditch:

CHESTERTON
PORTER
VALPARAISO
EAST GARY
HOBART
GRIFFITH

In addition, at least one city, Whiting, Indiana, has a combined sewer overflow which discharges directly to Lake Michigan.

Industrial Wastes

Industrial waste information in this report was obtained from records of the Indiana Stream Pollution Control Board, the Illinois State Sanitary Water Board, the Metropolitan Sanitary District of Greater Chicago, from a number of the industries, and from studies by the Public Health Service. In particular, the Public Health Service conducted a sampling

Survey of Industrial Wastes in the Calumet Area in the latter half of 1963.

The principal sources of industrial waste in the Calumet Area are located in Figure VI-1 (P. 157). The industries are listed in Tables VI-3 and 4 which show the principal municipal and industrial sources of oxygen-demanding waste, ammonia nitrogen, phenolics, cyanide and oil.

The Grand Calumet River and Indiana Harbor Canal are grossly polluted. There is no dissolved oxygen in the Indiana Harbor Canal, and its waters and banks are covered with oil. The lakeward reaches of Indiana Harbor are rust-colored from waste pickle liquor. The effects of this pollution extend into Lake Michigan. The largest sources of waste on the Grand Calumet River and Indiana Harbor Canal are the United States Steel Corporation, Gary, Indiana; the Youngstown Sheet and Tube Company, East Chicago, Indiana; and Inland Steel Company, East Chicago, Indiana. Three petroleum refineries are lesser, but still major sources of waste. They are Cities Service Petroleum Company, Sinclair Refining Company, and Mobil Oil Company, and all in East Chicago, Indiana. A summary of waste loads from these six plants is as follows:

			Pounds Per Day			
COMPANY	MGD	PE	Ammonia Nitrogen	Phenol	Cyanide	Oil
U.S. Steel, Gary, Ind.	330	266,000	13,750	1,500	1,700	54,000
Youngstown S&T E.Chi., Ind.	250	100,000	4,090	250	250	18,900
Inland Steel, E.Chi., Ind.	480	200,000	16,800	620	940	24,800
Cities Service, E.Chi., Ind.	80	47,400	1,140	130	----	4,040
Sinclair, E.Chi., Ind.	4	4,740	130	190	----	290
Mobil Oil Co., E.Chi., Ind.	4	12,400	1,130	780	----	----

All of these plants have invested in waste treatment facilities. The United States Steel Corporation quenches coke with ammonia still wastes and discharges waste pickle liquor to an absorption lagoon. U. S. Steel discharges blast furnace flue dust to the Grand Calumet River and recovers it with a dredge that is located in the river permanently. The Youngstown Sheet and Tube Company recovers phenol and most of its pickle liquor, and recovers blast furnace flue dust with thickeners. Inland Steel Company recovers phenol and blast furnace flue dust, but discharges waste pickle liquor to the Indiana Harbor Canal. Analysis of the wastes from these three steel plants indicates that large amounts of coking wastes are reaching the Grand Calumet River and Indiana Harbor Canal.

Cities Service Petroleum Company provides oil separators and sulfide and ammonia strippers, and has installed a secondary treatment pilot plant. Sinclair Refining Company provides oil separators, an ammonia and sulfide stripper, a sulfide oxidation tower, and removes phenol by extraction with crude oil and oxidation in a cooling tower. The total amount of waste is limited by a large amount of water reuse. Sinclair also skims oil from the Lake George Branch, Indiana Harbor Canal, to help decrease the oil nuisance. Mobil Oil Company provides oil separators, cooling towers, and straw filters. A sulfide and ammonia stripper is under construction. A sulfide oxidation tower is being installed. Mobil Oil Company uses the Indiana Harbor Canal as a water supply.

E. I. DuPont de Nemours & Company, East Chicago, Indiana, produces hydrochloric acid as a by-product of one of its manufacturing operations. It is reported that the Indiana Stream Pollution Control Board has approved discharge to the Grand Calumet River through an underwater waste diffusion system of a maximum of 90,000 pounds per day of chloride, and at normal river flows, a maximum of 125,000 pounds per day of unneutralized hydrochloric acid that would use up to 25 mg/l of natural alkalinity in the river. The approval was granted with the understanding that the Company would make every effort to sell the acid rather than discharge it to the Grand Calumet River. The Company has advised that all hydrochloric acid is now being sold, and that no chlorides or acid from this operation are being discharged to the river.

The Midwest Steel Division, National Steel Corporation, provides a high degree of treatment for its sheet and tin mill wastes. There is no significant pollution to Burns Ditch from this source, and this plant illustrates the degree of waste control that can be achieved in a steel rolling mill. The Bethlehem Steel Company is installing similar waste treatment facilities for its Burns Harbor sheet and tin mill, now under construction. When the proposed Burns Harbor deep water port is constructed, these two companies plan to install basic steel and coking facilities. Their plans to control waste from these future facilities have not been reported. The State of Indiana has notified the companies that adequate waste treatment must be provided and plans must be approved before basic steel mills are constructed.

The principal sources of wastes that discharge directly to Lake Michigan are Union Carbide Chemicals Company, Whiting, Indiana; American Oil Company, Whiting, Indiana; American Maize-Products Company, Hammond, Indiana; and United States Steel Corporation, Chicago, Illinois. Wastes from the first three are summarized as follows:

COMPANY	MGD	PE	POUNDS PER DAY AMMONIA NITROGEN	PHENOL	OIL
Union Carbide, Whiting, Ind.	43	99,000	----	13	0
American Oil Co., Whiting, Ind.	97	57,000	3,800	1,100	3,950
American Maize-Products Co. Hammond, Ind.	9	44,000	----	----	----

Union Carbide Chemicals Company has a quench water recirculation system. Other wastes are mostly soluble in water, and no treatment is provided. Recently large amounts of pellets of material similar to polyethylene have been found washed ashore on the beaches in Chicago. It is believe that Union Carbide is possible source of this material.

American Oil Company provides oil separators on both process wastes and cooling water return flow, and secondary treatment on process wastes. American Maize - Products Company discharges some wastes to the Hammond Sanitary District. Other wastes are treated in an anaerobic - aerobic lagoon and chlorinated before discharge. A decrease of 80-90 percent in BOD in the Lagoon system is reported.

The United States Steel Corporation,

South Works, Chicago, Illinois has no coke plant. Its principal wastes are blast furnace flue dust, oil, and hydraulically quenched blast furnace slag (popcorn slag). The amount of flue dust that overflows the thickeners is not known, but discoloration of Calumet Harbor and Lake Michigan is evident from the air. The company provides oil separators, but their effectiveness is not known. Popcorn slag at times is discharged and washes ashore at such places as Calumet Park Beach in Chicago where it becomes a nuisance to bathers. No significant amount of pickle liquor is discharged. Blast furnace flue dust and oily wastes have been observed to flow into Indiana waters of Lake Michigan, which lie about 1/3 mile off shore.

Wisconsin Steel Works, Interlake Iron Corporation, and Republic Steel Corporation, all in Chicago, have their coke plant wastes sewered to the Calumet Sewage Treatment Plant. The data in Table VI-6, however, indicate that some coke wastes are probably discharged to the Calumet River by Interlake Iron Corporation. Only Republic Steel Corporation discharges a significant amount of pickle liquor. It has not been reported whether this pickle liquor is neutralized before discharge. All three plants provide thickeners for recovery of blast furnace flue dust. Some popcorn slag has been traced to the Wisconsin Steel Works.

Cargill, Inc., Chicago, Illinois, provides septic tanks for domestic wastes. Wastes from refining soybean oil contribute 8,700 PE to the Calumet River. An industrial waste treatment plant providing neutralization and anaerobic-aerobic treatment has been constructed, but has not been reported to be in operation.

Lever Brothers Company, Hammond, Indiana discharges about 18,000 PE to the extreme northern end of Wolf Lake. Several acres of the lake have been polluted and fish kills have been reported. Studies of Wolf Lake by the Public Health Service have not disclosed evidence of significant interstate pollution.

Acme Steel Company, Riverdale, Illinois, discharges raw sewage from approximately 2,900 of its employees. It also discharges a substantial amount of unneutralized pickle liquor. The Company provides scale pits, oil separators and a thickener. Acme Steel Company is drawing plans to separate the domestic waste from the combined system so that the domestic waste may be discharged to the existing sewerage system. Further, plans are being made for revision of production operations needed for the installation of a pickle liquor waste disposal system.

Victor Chemical Company in Chicago Heights, Illinois discharges an estimated 3,300 pounds per day of phosphate via the State Street Ditch and the Sanitary District of Bloom Township. This phosphate can potentially produce algae nuisances downstream in the Illinois River.

Federal Installations

There are presently twenty-five Federally owned or leased installations in the conference area. Of these twenty-five installations, seventeen are housing units which have been leased for army personnel when off-base housing was needed. The number of these housing units and their location varies as the needs for housing occur. In the leasing agreements, the responsibility for providing sewage disposal lies with the various building owners.

The other Federal installations in the area include four Nike missile sites, one Corps of Engineers lock and dam, one Naval reserve training center, one Defense material supply depot, one Coast Guard light station. Waste treatment facilities appear to be adequate for all of these installations except the light station located at the mouth of Indiana Harbor. This installation, known as the Indiana Harbor Light, has a personnel complement of 3-4 persons and their domestic sewage is discharged untreated directly to Lake

Michigan.

A waste disposal problem could possibly occur at the Defense material supply depot located on Wolf Lake, Hammond, Indiana. This installation is built on a land fill area and the soil is not ideal for the septic tanks and tile drain fields which are currently being used. The depot is now manned by a staff of only 15-20 persons. In the event that activity at this installation is increased or changed, the waste disposal system should be reviewed, and the possibility of connecting to the Hammond Sanitary District sewers should be investigated.

Bulk Storage Areas and Barges

Open air storage of iron ore, coal, and limestone at unloading sites adjacent to waterways is a potential source of pollution. If the stockpiles are not properly drained, dust and granular material may be washed into the streams by rainfall. These materials may be carried to the lake in suspension if the stream velocity is adequate, or they may settle in the dock area.

Bulk storage areas for petroleum products, commonly called tank farms, are also potential sources of pollution. Although tanks may be adequately diked, accidental spills can occur in connection with the transfer of liquid between tanks, or in the operation of loading or unloading a vessel or barge. These may be due to human error or mechanical failure.

An accident spill occurred in December 1963 at the American Oil Company dock in the Lake George Branch of the Indiana Harbor Canal. A barge containing about 10,000 barrels of highly toxic toluene was being unloaded, when suddenly the bow of the barge sank with three valves open. An unknown amount of toluene escaped to the canal approximately 14 hours before the leak was controlled. As far as is known, no serious damage resulted from the spill. This was partly due to the high volatility of the toluene, which evaporated rapidly.

Vessel Pollution

Cargo vessels accounted for about 11,000 trips through Calumet Area deep water ports in 1963. In addition, several thousand pleasure craft operate out of marinas in the area. Wastes discharged by these vessels seldom undergo any treatment, although some boats have facilities for treating or holding sanitary wastes. The principal vessel wastes are sanitary, garbage, refuse and drainage, ballast and bilge water, dredged materials, compartment washings, and cargo losses. Uncontrolled discharge of these wastes can result in serious pollution problems to beaches, shore property, recreational waters, and municipal and industrial water supplies.

The Chicago Water Department has had a problem during the recreational boating season with plastic "Marine sanitary Bags" getting onto screens, settling basins and filter beds. Apparently, pleasure boat operators use the bags for sanitary wastes and then throw the sealed bags overboard into Lake Michigan.

In general, existing Federal, State, and local regulations restricting the discharge of vessel wastes are primarily aimed at protecting municipal water supplies and preserving navigation channels. Enforcement of these regulations is difficult at best. Posting of regulations and surveillance efforts by the Public Health Service, the Coast Guard, and the Corps of Engineers constitute the control measures.

VII - LAKE CURRENTS

Intensive studies of currents and temperature changes were made by the Public Health Service in the Illinois-Indiana-Michigan boundary waters from November 1962 through July 1964. The study used automatic recording current meters and free floating current measuring devices. Additional current meter studies were conducted in the Calumet Harbor area during the summer and fall of 1963 by the U. S. Lake Survey. The studies indicate a prevailing flow from south to north along the southern and the adjacent southwestern portion of Lake Michigan.

Only three pertinent studies of currents have been made in Lake Michigan prior to the present study. From 1892 through 1894, Mark Harrington of the U.S. Weather Bureau released a series of drift bottles over a three year period. In 1954-55, James Johnson of the U.S. Bureau of Fisheries made an intensive study of surface currents using drift bottles and drift cards. Also, in 1955, Dr. John Ayres and others of the University of Michigan used drift bottles and temperature studies to show currents in the lake.

These studies were confined to the summer period and are based on a very limited period of study. The information was too narrow in scope to be usable for background information.

General Considerations

Both wind and the shore are the primary factors which influence the flow of water in the southern part of the lake. Wind is the energy source for putting the water in motion, and the shoreline is responsible for the general direction of flow in this area. Water movements, in general, tend to parallel the shore as the water gets shallower. Water tending to move parallel to the shoreline is illustrated by the patterns of flow found in the Calumet Area.

Density plays a role in the movement of materials put into the lake. A pollutant discharged into the lake will rise, sink or come to rest within the water mass depending on its initial density.

Existing currents or absence of currents also affect the discharge of a pollutant. If a pollutant is discharged into the lake during near calm periods it will build up into a stationary mass. If the pollutants are discharged into an existing current it will be diluted by the moving water. The initial dilution depends on the rate of discharge of the pollutant and the speed of the current.

The most important types of motion are mixing and transport. Mixing refers to the rate of dilution of a pollutant. Transport is the net movement of a water mass from one area to another.

Relationship to Municipal Water Supplies

Water transport can be divided into two broad types, short and long term. Short term means up to a few days in length and long term would include months of travel. Data shown in Figures VII-1, 2, 3, and 4 (PP. 163, 164, 165, 166), refer to over 20,000 continuous current meter observations from various stations in southern Lake Michigan near or adjacent to the Calumet Area. The data from the current meter stations describe the flow in the area shown.

Two specific periods, January 21 to 24, 1963 and March 14 to 16, 1963, shown in Figure VII-1 (P. 163) and VII-2 (P. 164), show the pattern of flow from current meter records. During both periods the City of Chicago Water Department experienced severe taste and odor problems from water taken at the cribs. On January 20, 1963, the odor threshold level at Whiting and Hammond were recorded at a value of 8 at both intakes. These values jumped 4 to 5 times by the following day and nearly 15 to 20 times by January 22. The flow of water past the intakes was toward the northwest as shown in Figure VII-1 (P. 163). On January 24, just two days later, the Chicago South District Filtration Plant recorded its first taste and odor problems in 1963. Taste and odor problems were not experienced farther to the north at this time, indicated that the pollution occurred to the south as shown by the water movements.

Figure VII-2 (P. 164), shows the conditions during the second occurrence in 1963 when severe taste and odor problems occurred at Chicago. Water flow during the March 14 to 16, 1963 period was again from the south to the north.

Mixing rates can vary widely depending on the weather conditions. During the times of taste and odor difficulties experienced by Chicago both in January and in March 1963, chemical analyses showed that the water mass was diluted about four times while in transit from the Whiting-Hammond areas to the Chicago intake.

Studies made during April 1963 near Chicago indicate that the dilution ratio following near calm conditions is less than five for currents up to one foot per second and five miles of travel.

Figure VII-3 (P. 165), shows typical annual water movements in the Illinois-Indiana region. Regardless of the season of the year, the prevailing flow is from the south, although flows from the north also occur, as shown. From December through March strong northeast storms, as well as prolonged west and west-southwest winds, account for the relatively greater percentage of time when flow is from the north. From April through July the total percentage of flow from the south is less than 50 percent, but is still the dominant sector. From August through November, currents show a very dominant flow from the south. The winds over the lake during the summer are primarily from the south and southeast and in the winter are from the northwest, both of which maintain the northward flow of water.

Figure VII-4 (P. 166), illustrates the independent results of continuous summer and fall studies made by the U.S. Lake Survey in and adjacent to Calumet Harbor. The Lake Survey concluded that the northwestward flow past the harbor was a typical summer condition. This flow was reversed only by strong northerly winds.

Current speeds along the shore and in the upper layers move between 2 and 5 miles per day for 60 percent of the time. Movement from the Indiana area to the Chicago vicinity will normally take from three to four days for average conditions. Under storm conditions or periods of high winds, it could travel the distance in less than one day.

Summary

The general pattern of flow during the

year in the southwest corner of Lake Michigan is from south to north. Northwest and southerly winds maintain this flow. Reversals to this pattern occur only after prolonged wind shifts of more than eighteen hours in length when the wind is from the northeast and southwest.

Specific occurrences of taste and odor problems experienced at the South District Filtration Plant were shown to originate in the Indiana portion of Lake Michigan.

VIII - EFFECTS OF WASTES ON WATER QUALITY AND WATER USES

Water Quality Criteria

The quality of water as it affects the health or welfare of people in the environment is adjudged by many criteria. These criteria range from characteristics readily discernible to the senses of sight and smell, to tests requiring highly sensitive laboratory equipment and sophisticated techniques. The following paragraphs discuss the more important tests and their significance, preliminary to a description of quality conditions and effects in specific parts of the stream and lake system.

Dissolved Oxygen (DO)

The small quantity of oxygen dissolved in water is perhaps the most important single ingredient necessary for a healthy, balanced, aquatic environment. Dissolved oxygen is consumed by living organisms through respiration and is replenished, if a well-balanced environment exists, by absorption from the atmosphere and through the life processes of aquatic plants. When organic pollution enters this environment, the balance is altered. The bacteria, present in the water or introduced with pollution, utilize the organic matter as food and multiply rapidly. The resulting oxygen deficiency may be great enough to inhibit or destroy the fish and other desirable organisms and to convert the stream or lake into an odoriferous nuisance. Solubility of oxygen in water is quite low, saturation values ranging from 8 to 13 milligams per liter (mg/l) depending on water temperature and, in lesser degree, on atmospheric pressure. Commonly accepted minimum concentrations that should be maintained at all times to prevent nuisance and promote desirable aquatic life, range from a minimum of 3 mg/l, which will support minimal aquatic life and rough fish, to 6 or more mg/l for certain types of game fish. It is considered that a reasonable goal for dissolved oxygen in Calumet Area streams is an absolute minimum of 3 mg/l and preferably not less than 4. For Lake Michigan itself, it is both reasonable and highly desirable that dissolved oxygen concentration be maintained at or near saturation levels.

Biochemical Oxygen Demand (BOD)

The biochemical oxygen demand of municipal and industrial waste waters is exerted by three classes of materials: 1) carbonaceous organic materials, 2) oxidizable nitrogen compounds, and 3) certain chemical reducing compounds which will react readily with dissolved oxygen. In general, high BOD values can be expected to result in lower dissolved oxygen levels in the receiving waters, greater need for chlorine and chemicals for water treatment and may cause tastes and odor in treated water.

Bacterial Pollution Indicators

Two indicators of the degree of bacterial pollution are used in this report: the traditional coliform bacteria test, and the more recently developed test for fecal streptococci. Since the origin of most of the coliform group of organisms is the intestinal tract of warm-blooded animals, including man, the presence of these organisms in a body of water is strongly indicative of contamination of the water by fecal matter. Waters so contaminated must be presumed to contain also pathogenic bacteria and viruses, some identifiable and some quite difficult to isolate. The fecal streptococci (fecal strep), which are also enteric organisms abounding in the intestinal tracts of warm-blooded animals and man, likewise indicate the presence of fecal matter in water. Moreover, the fecal strep test is a more positive indicator, because some of the coliform group may be found in nature, in soil, etc., and may multiply in water -- whereas the fecal strep generally do not multiply outside their natural intestinal habitat.

Coliform and fecal strep concentrations, expressed herein as the number of organisms per 100 milliliters (ml) of water sample, are therefore indicators of the degree of hazard from waterborne disease. While any degree of hazard to health is undesirable, the complete elimination of hazard is impossible, and many states and other organizations have established or proposed limiting values on the indicators. For assessment of the degree of bacterial pollution in waters of the Calumet Area, the following guidelines are proposed:

A) For recreational use involving intimate contact such as swimming, water skiing, and skin diving, coliform concentration should not exceed 1,000 MPN per 100 ml and fecal strep count should not exceed 20 MPN per 100 ml;

B) For uses involving limited body contact, such as commercial shipping (barge traffic), and boating, coliform and fecal strep counts should be, respectively, not more than 5,000 to 100 per 100 ml;

C) For municipal source water, at the intake, average coliform concentration should not exceed 5,000 per 100 ml in any one month, and not more than 20 percent of individual samples in any one month should exceed that amount.

It is imperative here to note that the foregoing suggested guidelines for bacterial pollution are to be regarded as restrictive, not permissive. That is to say, as subsequently recommended, pathogens and associated organisms originating in human wastes should be destroyed by disinfection, to the greatest degree feasible, at waste treatment plants prior to discharge. Referring particularly to Lake Michigan, the natural bacterial quality of its water is excellent, and every reasonable effort should be made to keep it that way.

Phenols

Phenolic material, which includes phenols, cresols and xylenols, when found in water is usually the result of pollution by industrial wastes. Very low concentrations of phenols can impart a disagreeable taste to water when chlorinated. Thresholds of taste and odor for chlorophenols range from 1 to 20 micrograms per liter (ug/l). (Practically speaking, one microgram per liter is equal to one part per billion by weight.) The drinking water standards of the U.S. Public Health Service recommend that phenols not be present in a water supply in excess of one microgram per liter where other more suitable supplies are or can be made available.

Biological Indicators

The kinds and numbers of aquatic plants and animals inhabiting a particular body of water, and the stream or lake bottom beneath it, reflect the quality of water that has generally prevailed in the area for an extended period of time. Some plants and animals are capable, by virtue of physiological features or living habits, of withstanding polluted conditions and multiply rapidly when competition with less tolerant forms is eliminated. Examples of pollution-tolerant animals are the sludgeworms, bloodworms, leeches, and pulmonate snails, that exist in the decaying organic sediment which builds up from the settleable organic solids present in most waste discharges. A benthic (bottom-dwelling) population consisting of many kinds of organisms with low numbers of each species is typical of unpolluted waters.

Calumet Area Streams

Except as otherwise noted, the statements on water quality conditions in this and subsequent sections are based on field surveys and investigations conducted during 1961-64 by the Great Lakes-Illinois River Basins Project.

Biological Conditions

Summary results of biological studies for the Little Calumet River and the Calumet River are shown in Figure VIII-1 (P. 167). These studies confirmed that all of the streams in the Calumet area are polluted, differing only in degree and by nature of the pollutant. The Grand Calumet River is the worst of all as evidenced by a near-absence of bottom organisms. The Little Calumet and Calumet Rivers and the Indiana Harbor Canal were also found severely degraded. None of the streams exhibited a balanced bottom-dwelling community.

The Calumet River from its confluence with the Grand Calumet River to its mouth in Calumet Harbor is severely degraded. The stream was highly turbid. Oil slicks and floating sewage solids were observed. At stations at the mouth, and five miles upstream from the mouth, the bottom was composed mainly of organic ooze that had a sewage and petroleum odor. Near the mouth of the Grand Calumet River the bottom deposits of the

Calumet River were composed of inert or inorganic materials.

Only very pollution-tolerant sludgeworms (Oligochaeta) existed in the reach from Lake Calumet downstream (away from Lake Michigan). From Lake Calumet upstream to the harbor mouth (Lake Michigan inlet), sludgeworms predominated, but the presence of fingernail clams (Spaeriidae) indicated a slight improvement in water quality and bottom conditions. Sludgeworms averaged more than 5,000 per square foot in this stream reach.

Attached filamentous algae, routinely scraped from substrata in this river, were very pollution-tolerant blue-green forms. No pollution-sensitive filamentous forms were found.

The bottom sediments of the Little Calumet River were composed of ooze and organic debris along with some gravel and rubble. The dredgings had a sewage odor. The water was highly turbid and had a strong sewage odor at the station upstream ten miles from Thorn Creek. Slime was evident for about three miles downstream in the barge canal from the confluence with the Grand Calumet River.

The organic bottom deposits of the Little Calumet River supported large numbers of pollution-tolerant sludgeworms, with population densities as high as 11,000 per square foot. There were no pollution-intolerant organisms. Pollution-tolerant blue-green algae were the only aquatic plants living in this river.

The Grand Calumet River was practically barren biologically. Although there were thick deposits that usually provide a suitable habitat for sludgeworms, extended septic periods and toxic pollutants prevented their establishment.

Only the very pollution-tolerant filamentous blue-green algae occurred. The bottom was composed of minute iron particles at the farthest station upstream near the headwaters in Gary, Indiana. Westward from that point to the Indiana Harbor Canal, the bottom consisted of rubble, petroleum wastes, and a heavy black oily organic ooze that had a highly objectionable sewage and petroleum odor. The stream surface was covered with oil.

Nutrients in treated sewage from towns in the drainage basin tributary to Burns Ditch, and the sluggishness of the stream, combine to effect a most favorable condition for planktonic algal growth. The subsequent die-off of the algae forms a bottom sediment favorable for populations of pollution-tolerant sludgeworms and bloodworms. The stream is biologically degraded but not as severely as other area streams.

Industrial pollutants inhibited the establishments of large numbers of bottom animals in the Indiana Harbor Canal. The highest number of sludgeworms, only 44 per square foot, were found near the southern end of the canal. The stations near the mouth at Indiana Harbor had only from two to ten sludgeworms per square foot. Oil slicks were observed at all stations and the water was very turbid.

Bacterial Pollution

The bacterial findings for Calumet Area streams reported herein derive from an intensive 24-day sampling survey conducted between August 20 and September 12, 1963. Samples were collected once a day at each sampling station on some 20 days of the period. Coliform and fecal streptococcus densities were determined for each sample, by the membrane filter technique. Representative average and maximum results are shown graphically on Figures VIII-2 (P. 168) and VIII-3 (P. 169). Gross fecal pollution is generally evidenced. It is also evident on the two Figures that the interstate flow from Indiana to Illinois through both Grand and Little Calumet Rivers is grossly polluted bacterially; this contributes materially to the health hazard tc downstream users, including workers on commercial barge lines and recreationists using the boating areas and boat launching ramps in the near vicinity.

Fecal streptococcus densities add further confirmation to the coliform indications of pollution. Sampling stations located near the State line on either side, in both the Grand and Little Calumet Rivers, had average fecal strep concentrations in the order of 70,000 to 80,000 per 100 ml.

Burns Ditch showed an average coliform density of 120,000 per 100 ml near its point of discharge to Lake Michigan, and 1.7 million per 100 ml about 4 miles inland. Fecal strep at the latter point averaged 83,000 ml.

In the Indiana Harbor Canal coliform counts averaged 380,000 per 100 ml, and individual tests ranged up to 2.5 million. Associated fecal strep values ranged as high as 40,000 per 100 ml.

In Wolf Lake, coliform densities as high as 19,000 per 100 ml were found in the Indiana portion, and values ranged downward to 250 per 100 ml at the lake's outlet connection to the Calumet River. It is believed that abnormally high coliform counts are confined to local areas of Wolf Lake, and there is no evidence of significant interstate bacterial pollution through this lake.

The Calumet River exhibited average coliform densities of 2,900 per 100 ml near its junction with Lake Michigan, increasing to 25,000 per ml about 3 miles farther inland. As described in earlier sections of this report, the Calumet River generally serves as one of the diversion channels carrying water away from Lake Michigan into the Illinois River system. Frequent reversals of flow occur, however -- occasioned by inversion of the flat water surface gradient due to storm runoff or local short-term lowering of Lake Michigan surface level due to surges (seiches) in the lake. Prolonged southwesterly winds could produce both such a lowering of Lake Michigan and a current movement within the lake that is from Illinois into Indiana waters. Thus, at times water from the Calumet River, polluted bacterially and otherwise, can cross from Illinois to Indiana. Whether such movement constitutes a hazard or detriment to water uses in Indiana would depend upon the effectiveness of dilutional mixing, the proximity of beaches or water intakes, and other factors -- but the possibility exists. Unquestionably the flow reversals are detrimental to beaches and other water uses in Illinois, along the shoreline immediately adjacent to the junction.

In summary, widespread and gross bacterial pollution prevailing throughout the waters of the

Calumet Area stream system constitutes a threat to public health. Any human contact with these waters entails an exposure risk of infectious disease. In addition, such waters comprise a habitat for insects (such as roaches) and animals (such as rats and birds) which can act as mobile disseminators of infection.

Biochemical Oxygen Demand and Dissolved Oxygen

Figure VIII-4 (P. 170) shows average BOD concentrations, at sampling stations on the Little Calumet River, for August-September 1963 survey period previously described. Noteworthy is the concentration of 20.3 milligrams per liter (mg/l) at mile point 333.1, just east of the Illinois-Indiana State line; combining with average stream flows for the period, that figure converts to a pollutional load of about 1,500 pounds per day of 5-day BOD crossing the line from Indiana into Illinois.

Figure VIII-5 (P. 171) shows BOD concentrations for the corresponding period in the western part of the Grand Calumet River. It will be noted that BOD concentration near the State line, at mile point 328.7, is 15.7 mg/l; combining this concentration with average stream flow indicates that about 3,200 pounds per day of 5-day BOD entered Illinois from Indiana through the Grand Calumet River.

For comparison with the foregoing, the Calumet Treatment Plant of MSD-Chicago discharges about 10,000 pounds per day of 5-day BOD into the reach of navigation channel between Lake Michigan and Blue Island Lock. Thus, the organic waste loads of an interstate nature, some 3,200 and 1,500 pounds per day of BOD respectively from Grand and Little Calumet Rivers, comprise a significant part of the total input to the reversible-flow portion to the navigation channel, and westward in the Calumet-Sag Channel. In the larger picture of the Illinois River channel system, downstream from the western end of the Cal-Sag Channel, such waste loads are dwarfed by the much larger inputs from MSD-Chicago's main plant at Stickney.

Average dissolved oxygen conditions in the Grand and Little Calumet Rivers corresponding in location and time to the BOD conditions just discussed, are shown in Figures VIII-6 (P. 172) and VIII-7 (P. 173). Not only did critically low average DO conditions prevail generally throughout the area, but some individual samples showed zero DO at every station. The anomalous value of 4.9 mg/l average DO at mile point 337.2 in Indiana, near the point where the Little Calumet River divides to flow east and west, is worth special comment. Here the individual samples showed extreme variability in DO, ranging from zero to 25.6 mg/l. The latter represents a high degree of supersaturation and a very unstable transient condition. This anomaly is attributed to intense algal activity and a lagoon effect in the shallow, sluggish, nutrient-rich water.

Lake Michigan

The following discusses the effects of wastes entering Lake Michigan in the Calumet Area on the quality of the lake and the uses made of it. Wastes entering Lake Michigan come from the Indiana Harbor Canal, industries discharging along the shoreline in Indiana and Illinois, reversal of flow of the Calumet River in Chicago, to a lesser extent the discharge from Burns Ditch in Indiana, and at least one storm water overflow in Whiting, Indiana.

Biology

Between 1961 and 1963 more than 450 bottom dredgings were made in the lake area from Willamette, Illinois to Indiana Dunes State Park and lakeward about 30 miles. The lake was divided into sectors bounded by 15 minute lines of latitude and longitude, and the numbers of organisms per square foot and the kinds of organisms comprising the bottom animal communities were determined for each sector. Summary results of those data are shown in Figure VIII-8 (P.174) and illustrate the effects on Lake Michigan of the sources of pollution in the Calumet Area.

The bottom animal communities of this area of Lake Michigan were composed of only a few different kinds of organisms. Sludgeworms (Oligochaeta) and aquatic scuds (Amphipoda) were more numerous, but bloodworms (Tendpiedidae) and fingernail clams (Sphaeridae) were sometimes abundant. Of these four different kinds of animals only one, the scud, is sensitive to pollution, preferring a clean sand or gravel bottom and relatively clear water. Where the lake bottom is subjected to deposits of organic materials the conditions are more favorable for sludgeworms, bloodworms and fingernail clams.

Figure VIII-8 (P. 174) shows the population differences in bottom organisms from one sector to the other. In Sector 3, offshore from the Calumet Area streams, pollution-tolerant organisms averaged 400 per square foot, and there were only a few clean water associated organisms. In Sector 2, also Calumet Area shoreline waters, pollution-tolerant organisms averaged about 250 per square foot, and again there were only a few pollution intolerant organisms. In Sector 6, which is north of Sectors 2 and 3, and along the Chicago shoreline, pollution tolerant organisms averaged about

1,000 per square foot of lake bottom and pollution intolerant forms averaged about 50 per square foot. This more than two-fold increase in pollution tolerant organisms is attributed to an organic sediment that is a more suitable habitat for organisms such as sludgeworms and less favorable for clean water associated organisms. The reason sludgeworms were less numerous in Sectors 2 and 3 is that the heavier suspended particles contained in wastes from the steel industries settle out before they are carried northward to the Chicago waterfront. Some of the lighter organic particles from sewage and other organic waste sources also settle out near the Calumet Area, but some are carried northward by lake currents, and deposited along the Chicago shoreline. In addition, toxic and inhibitory materials in some of the industrial pollutants are more highly concentrated in the Calumet Area of the lake than off the Chicago shoreline. The lower concentration of toxic substances in the Chicago Area would permit larger populations of organisms to develop.

Further evidence that wastes from the Calumet Area are deposited in the Lake near Chicago is in odors of the dredgings from this area of Lake Michigan. Some of the dredgings from the sectors along the shore contained organic sediments described as ooze.

Sewage odors were detected in some of the dredgings in Sectors 1, 2, 3 and 6; and petroleum odors were detected in bottom muds from Sectors 1 and 2.

The organic materials discharged in the Calumet Area, and carried by the streams into Lake Michigan, have created a condition deleterious to aquatic life. This is indicated by the predominance of sludgeworms over kinds of organisms beneficial to fish. The aquatic scud is one of the principal food organisms for desirable species of Lake Michigan fish, particularly the whitefish, lake trout, and yellow perch. In this area where scuds are scarce there is inadequate food for large populations of desirable fish. Trash fish like carp, buffalo and suckers usually predominate in a lake area where the bottom sediment is organic.

Pollution of this large area of Lake Michigan is especially serious because it is practically irreversible. That is, the conditions that now exist will not necessarily improve with the cessation of present waste discharges. In a stream where there is a current moving in one direction there is a tendency for the bottom deposits to be scoured away. However, lake currents are weak and shifting, and bottom deposits might move only slightly over a long period of time.

In addition to the study of the bottom organisms, samples of water were collected for planktonic (free floating) algae evaluations. The information obtained about the abundance and kinds of algae presents further understanding of the effects of pollutants. If growth factors such as water movement, temperature and light are favorable, the planktonic algae populations increase with an increase in growth nutrients. There are a wide number of algal growth nutrients but, just as agricultural crops such as corn and soybeans require measureable amounts of phosphorus and nitrogen, so do the planktonic algae. Inorganic nitrogen and total phosphate concentrations of 0.3 milligrams per liter and 0.03 milligrams per liter, respectively, at the start of the algae growing season are considered sufficient to cause nuisance algal conditions. Concentrations of inorganic nitrogen were higher than 0.3 mg/l in the Lake Michigan area adjacent to the Calumet area. However, total phosphate values were near, but rarely ever more than 0.03 mg/l. Secchi disc readings in this area were generally about three feet. Dense populations of planktonic algae did not occur, probably because of a shortage of phosphorus, and because suspended matter restricted light penetration. If the discharge of phosphorus and other nutrients continues, the concentration of phosphates can be expected to surpass the critical level of 0.03 mg/l and algal nuisance conditions will occur.

Bacteriology

The waters off the Calumet area and the Chicago area were studied during 1962 and 1963 in a series of sampling cruises. Coliform and fecal streptococcus determinations were made. Virtually none of these organisms were found in the deep water of the main body of Lake Michigan. Highest coliform concentrations occurred in the waters extending from the mouth of the Calumet River to the Indiana Harbor and out to a distance of approximately two miles offshore. Coliform densities as high as 7,000 per 100 ml were observed in this area. In the zone extending on eastward to Burns Ditch all determinations were in the range of 1 to 1,000 per 100 ml at a distance up to two miles offshore. Coliform densities in the range of 100 to 1,000 were observed extending outward from the Calumet Harbor-Indiana Harbor area for a distance of five to seven miles. Such densities were detected at the Indiana-Illinois boundary line running east and west in Lake Michigan, due north of Whiting. The waters of the south end of Lake Michigan are thus shown to be receiving large loads of fecal pollution originating in the Calumet Area and moving out into Lake Michigan.

Data from records of the Chicago Park District on the occurrence of coliform bacteria on beaches in the Calumet Area and northward along the Lake shore in Chicago are shown below. Each beach was sampled on 20 to 30 different days during the bathing season each year, and the table shows the number of days sampled on which the coliform count exceeded the values shown.

Beaches	No. of sampling days when coliform were											
	110,000 or greater				greater than 10,000				greater than 1,000			
	1961	62	63	64	61	62	63	64	61	62	63	64
Indiana												
Whiting	2	5	7	0	8	12	14	1	19	20	23	16
Hammond	2	12	9	1*	6	13	14	5	19	20	23	18
Illinois												
Calumet	1	1	1	0	4	3	12	3	22	19	25	18
Rainbow	1	0	0	0	2	0	1	0	10	10	9	8
67th St.	0	0	0	0	0	1	2	2	9	9	7	10
Jackson Pk.	0	0	0	0	2	2	2	1	12	11	12	11
57th St.	0	0	0	0	0	0	1	1	12	5	11	6
49th St.	0	0	0	0	0	0	1	0	5	3	5	4

*240,000

It is evident that Whiting Beach and Hammond Beach in Indiana and Calumet Park Beach in Chicago are the most heavily polluted. These beaches lie within the artificial bay created by the Calumet Harbor breakwater and Indiana Harbor, and are directly subject to pollution by wastes discharged to Lake Michigan in the Calumet Area. Coliform densities usually exceed 1,000 per 100 ml, and are often 100 times higher. The beach at Hammond is closed to swimming by orders of the Hammond Health Department due to high coliform concentrations. The beach is posted for no swimming.

The effects of bacterial pollution from the Calumet Area are extended to beaches farther north along the shoreline, although to a diminishing extent. These relationships are shown in Figure VIII-9 (P. 175). The locations of the beaches are shown in Figure V-1 (P. 156).

The water intakes of Chicago's Dunne Crib and South District Filtration Plant are often affected by those polluted waters moving northward from Indiana and the mouth of the Calumet River. Rainbow Beach and the filtration plant are immediately adjacent, and Dunne Crib is two miles offshore. The bacterial records of water from both the plant and crib intakes substantiate the presence of waters carrying fecal pollution. At times the quality of the water abruptly worsens and coliform densities increase sharply. During the last part of November 1963, for example, coliform densities as high as 5,800 were recorded through an eight-day period. Higher coliform densities have been recorded in other seasons and years since 1950.

Phenolic Materials and Taste and Odor

In 1962 Lake Michigan studies by the Public Health Service, phenol samples were collected at three Indiana Harbor stations. Results at these stations and at one nearby lake station were slightly higher than values found in other inshore sampling. The most notable result was a phenol value of 6.8 mg/l (micrograms per liter).

In the first half of 1963, stations were located within the inner harbor area, and at these stations the analytical results showed definite degradation of water quality. Phenols were as high as 52.4 mg/l. At the stations adjacent to the harbor, the phenols were present in concentrations ranging from 0.4 to 10.0 mg/l. The May, 1963 studies showed that phenol values at nearly all of sixty-four lake stations in the Indiana Harbor, Calumet Harbor, and adjacent lake stations exceeded 1 mg/l.

A special study in the Calumet and Indiana Harbor area was made for phenols during the period of October 20 through December 9, 1963. Figure VIII-10 (P. 176) illustrates a typical set of results obtained during this study. One day's sampling was selected for this figure (October 22, 1963) to show a typical flow pattern because averages on individual lake stations have proved to be misleading. Changes in wind direction from day to day cause the pollution plume to alter its course. The direction and severity of such pollution plumes are best represented by a separate examination of each individual day's sampling. Averages are useful in showing larger range effects on the general water quality of sizable areas in the lake, but averages of all results at individual stations do not successfully produce either of the desired patterns.

The phenol values shown in Figure VIII-10 (P. 177) were 127 mg/l in Indiana Harbor, 56 mg/l at the harbor mouth, and 72 mg/l a half mile out in the lake. At points two miles and four and one-half miles in a northwesterly direction, results were 6 mg/l. They decreased to 5 mg/l in another mile and to 3 mg/l as the State line was crossed. Higher results (4 to 12 mg/l) were observed near the shoreline between Indiana Harbor and Calumet Harbor and in Calumet Harbor. These phenol results were associated with a phenol value of 254 mg/l in the Indiana Harbor Canal on the same day.

To illustrate both the average results and the maximum results in both the Indiana and Calumet Harbor area and the Chicago water intake areas, Figure VIII-11 (P. 177) show the average of all samples collected in these areas in 1962 and 1963.

The average of 518 samples in the Calumet Harbor-Indiana Harbor area was 16 mg/l. In the sector west across the State line, the average of 105 samples was 1.8 mg/l and in the sector to the north, where the Chicago water intakes are located, the average phenol value of 21 samples was 1.6 mg/l. It should be pointed out that the maximum values obtained in these three areas were respectively 354 mg/l, 32 mg/l, and 3.2 mg/l, all substantially higher than the typical day previously referred to in Figure VIII-10 (P. 176).

Phenols are decomposed by bacterial action in the presence of dissolved oxygen and their persistence from point-to-point is relatively short-lived, except during low temperature periods. The levels observed in the October study could be expected to be exceeded in colder weather, especially at the stations farthest removed from Indiana Harbor, near the water intakes.

The shore intake of the Chicago South District Filtration Plant is less than a mile from the Indiana State line. The Dunne Crib intake is about two miles offshore and less than three miles from the State line. The locations of these intakes are such that the problems which occur at this plant and the results of analyses obtained here are a direct reflection of interstate pollution.

Records of phenol determinations by the City of Chicago were obtained during 10 months of record in 1962 and the first three months of 1963. The 1962 phenol results ranged from 0 to 6 mg/l with an average of 2 mg/l. The phenol results from the first three months of 1963 averaged 1 mg/l.

The Filtration Plant reported that one of its most serious taste and odor problems occurred between January 24, 1963 and February 7, 1963, lasting 15 days. During this period threshold odor numbers increased from the usual level of 4 to a maximum value of 50 at Dunne Crib and 15 at the shore intake. Odors during this period were characterized as "hydrocarbon." This description is usually associated with industrial wastes. These high odor numbers are reflected in the heavy use of carbon in an effort to remove the odor. Associated with these objectionable odors were high ammonia nitrogen results which will be discussed in more detail later.

Other periods referred to by the Chicago

South District Filtration Plant as causing similar problems are shown in Table VIII-1 (P. 152). These periods were March 3 and 4, 1963, when threshold odor values of 8 (Hydrocarbon) at the shore and 12 (hydrocarbon) at Dunne Crib were reported. On April 2 to 7, 1963, threshold odor numbers up to 10 at the shore and 14 at the Crib were reported. Again these odors were reported as "hydrocarbon." Another critical period recently reported was a 20-day period from December 11 to December 31, 1964. During this period an excessive threshold odor of 90 (hydrocarbon) was obtained at Dunne Crib and 16 was obtained at the shore.

As was discussed in Section VII, the high threshold odor number in January and March 1963, were associated with movements of water from Indiana towards Chicago intakes.

Four Indiana water plants also take their water from Lake Michigan in the Calumet Area. The Gary-Hobart Water Plant reports that when high carbon dosages are required, hydrocarbon odors are always responsible. Acute problems were experienced in this plant in January, February, and March 1963, and less severe problems were experienced in January, February, March and December 1964. Threshold odors and phenol analyses were not reported.

The East Chicago Water Treatment Plant reports that beginning December 15, 1964, a strong phenol odor was detected. Threshold odor numbers for the next eight days ranged from 8 to 35, maintaining 35 for three consecutive days. Normal or average carbon dosages are 24 to 27 pounds per million gallons. During these eight days dosages were between 63 and 163 lbs/MG.

The Hammond Water Plant reports that when winds are from the southeast or northeast, intensive pollution due to phenols is experienced. In the past, phenols were experienced only during winter months but they are now expected at any time. Threshold odor numbers of 2,500 or higher have been recorded. On March 24 and 25 and April 2, 1964, a severe taste was experienced characterized as a "gasoline or paint" type. This continued with less severity for two weeks. An insecticide spill was identified on July 10 and 11, 1964, which took one week to eliminate from the system. During December 1 to 26, 1964, threshold odors from 30 to 79 were experienced for 77 percent of the time.

Whiting, Indiana, is located with industrial plants in close proximity on both sides. Industrial pollution never ceases to be a problem. Threshold odors are usually high, running 15 to 25 when severe problems are absent. During 1963 and 1964 much higher than average chemical dosages were required. Only one period of phenol results was available. Results from January 16 to February 6, 1963, ranged from 1 to 26 mg/l with an average value of 8 mg/l. Threshold odors during this period averaged 18 with a maximum of 100. In contrast during the week of December 24, 1964, threshold odors ranged from 300 to 2,000. Phenol analyses were not obtained during this period.

Because of the taste and odor problems reported in the first part of 1963, the Public Health Service began monitoring water intakes in Chicago and vicinity for organic contaminants. This program was continued until June 1964. The stations selected were Whiting, Chicago's South District Filtration Plant, Chicago Avenue, Evanston, and Waukegan. The carbon absorption method was used for this study and the average results are shown in Table VIII-2 (P. 153).

The Whiting, Indiana, plant showed significantly greater amounts of carbon chloroform extract than the other intakes. This is an indication of industrial pollution. An average value of 242 micrograms per liter found at this station can be considered a serious pollution load. Threshold odor numbers up to 3,000 have been reported at Whiting. The "Public Health

Service Drinking Water Standard - 1962" (PHS Publication No. 956) recommends a threshold odor number limit of 3. A study by Rosen and Rubin showed that 70 percent of the organic carbon in the carbon-chloroform extract from samples of intake water at Whiting, Indiana was fossil carbon, originating from petroleum and coal, and indicated industrial sources. The other 30 percent was contemporary carbon, indicating sewage origin.

The carbon filter extracts from the other water plants indicate they are receiving organic pollutants in their raw water of the same magnitude as obtained in the South District Filtration Plant. Unfortunately, carbon filter studies were not being made at the times of the most severe taste and odor problems reported by these plants, in January, March, and April 1963, and December 1964.

Nitrogen: Ammonia, Organic, and Nitrate-Nitrite

Nitrogen is necessary to the normal life cycle of aquatic life. If it is present with phosphate in moderate concentrations, accelerated growths of algae and plankton can result. Ammonia in high concentrations, above 2 to 2.5 mg/l and under alkaline pH conditions (pH8-8.5) is a substance toxic to many forms of aquatic life. At all levels it is an increased burden to municipal water treatment, because of its high chlorine demand.

A study of Indiana Harbor was conducted from May 8 to May 23, 1963, covering five stations inside the breakwater and 27 stations adjacent to the harbor. At the same time, a survey was also made covering 32 stations at Calumet Harbor. Four of these stations were located inside the breakwater, and the others were located outside the breakwater. The concentrations of ammonia nitrogen and organic nitrogen were found to be higher at the stations near the harbors than they were farther out in the lake and were much higher than concentrations found in the mid-lake waters.

Figure VIII-12 (P. 178) illustrates typical ammonia nitrogen results as found on November 24, 1963. The highest result was 2.4 mg/l in the Indiana Harbor Canal, followed by 1.5 mg/l in the inner harbor, 1.6 at the harbor mouth, and 1.1 mg/l at the point one-half miles from shore. Close by was another result of 0.5 mg/l. Four miles northwest of the harbor, the level was 0.45, and at five miles northwest of the State line, the result was 0.75 mg/l.

Figure VIII-13 (P.179) shows the average results of all samples collected in the Calumet Area studies. The data were analyzed in quadrangles of 15 minutes latitude and 15 minutes longitude. The average of 538 results in the Calumet Harbor-Indiana Harbor area was 0.35 mg/l. Across the State line to the west, the average result of 108 samples was 0.19 mg/l. To the north, in the area of the Chicago water intakes, the average value of 58 samples was 0.12 mg/l. While the averages are not significant from a health standpoint, they represent a nutrient load to the lake, and the maximum values between 2 and 4.5 mg/l in the Indiana Harbor-Calumet Harbor area could be toxic to many forms of aquatic life. In addition, the values up to 0.37 in the area of the water intakes contribute to the cost of water treatment. The levels also demonstrate the movement of pollution from the Indiana Harbor area northwestward toward the Chicago water intakes and shore area. Similar patterns were also observed for organic nitrogen and for nitrate-nitrite nitrogen results. The distribution of the total nitrogen results in the area emphasizes the nutrient load placed in the lake by the addition of nitrogen in the Calumet area.

Excessive amounts of ammonia discharged to interstate waters of Lake Michigan contribute to overfertilization of the lake, with consequent eutrophication or aging. Over-enrichment of the lake can cause prolific growths of algae and aquatic weeds that pile up onto beaches, clog water intakes, interfere with filter plant operations, and cause taste and odor problems in municipal water supplies.

An even better indication of the frequency and degree of this pollution can be found in the records of the Chicago South District Filtration Plant. The two analyses which were made daily on the raw water of this plant which was closely allied are ammonia nitrogen and threshold odor. Threshold odor has been discussed previously, but it bears some repetition on its relation to ammonia values. The shore intake of this plant is approximately eight miles from the Indiana Harbor and three-quarters of a mile from the Indiana-Illinois State line.

The effect of the ammonia in Lake Michigan water has been felt repeatedly by the Chicago South District Filtration Plant. This plant takes from 20 to 60 percent of its water from its short intake depending on the total demand on the plant, and the remainder of the water comes from the Dunne Crib, two miles off shore. Reports from this plant indicated that a critical water quality problem existed from January 24, 1963 to February 7, 1963.

During this period when the severe "hydrocarbon" threshold odor problem reached a maximum odor number of 50 at the Dunne Crib and 15 at the shore, high ammonia results were also obtained. The filtration plant reported that the normal ammonia value of raw lake water should be 0.004 mg/l and treatment problems occur with a rapid increase in chlorine demand when the ammonia nitrogen level exceeds 0.02 mg/l. During this period, the average ammonia values at the Dunne Crib were over 0.02 mg/l on twelve out of the fifteen days with maximum values over 0.10 mg/l on nine days and over 0.20 mg/l on four of the days. The average value at the short intake exceeded 0.04 mg/l every day, with maximum values more than 0.10 mg/l on nine days.

Other periods referred to by the Chicago South District Filtration Plant as causing similar problems were March 3 and 4, 1963, April 2 to 7, 1963, and December 11 to 31, 1964. On March 3 and 4, 1963, a threshold odor value of 12 was obtained at the Dunne Crib and 8 was obtained at the shore, again with the characteristic hydrocarbon odor. Ammonia values of 0.052 mg/l at the Crib and 0.10 mg/l at the shore were also obtained on this date. On April 2 to 7, 1963, threshold odors of 14 at the Crib and 10 at the shore were again associated with ammonia values as high as 0.14 mg/l at the Crib and up to 0.098 mg/l at the shore.

During the last reported problem period, December 11 to 31, 1964, a maximum threshold odor of 90 (hydrocarbon) and an ammonia value of 0.164 mg/l were obtained at Dunne Crib.

Although the highest ammonia values were obtained during the same periods as the highest threshold odors, the relationship does not always hold. High ammonia concentrations were also observed and problems occurred from them at a number of other times with no attendant increase in threshold odor numbers. Such conditions existed on numerous occasions, the most notable being from April 15 to May 20, 1963, when ammonia levels were over 0.05 mg/l for 20 days with three days over 0.11 mg/l and from November 18 to December 3, 1963, when ammonia nitrogen levels again ranged from 0.05 to 0.14 mg/l for twelve days.

During 1963 at the South District Filtration Plant, ammonia nitrogen results exceeded 0.02 mg/l on 187 days. Shown below is a breakdown of the number of days this and higher values were exceeded at the Dunne Crib and at the shore:

Ammonia Nitrogen Results	Shore (1963)	Dunne Crib (1963)
greater than 0.02 mg/l	182	187
greater than 0.05 mg/l	72	77
greater than 0.10 mg/l	6	15
greater than 0.20 mg/l		3

Ammonia problems are also reported by the Gary-Hobart Water Company which draws its water from Lake Michigan at Gary. Gary-Hobart reports odors suggesting gasoline, and that high ammonia concentrations are common in the raw water, the average magnitude being 0.10 mg/l. Water company officials report that each pound of ammonia in the raw water increases the chlorine demand by about 10 pounds. On seven days during January, 1963, ammonia concentrations ranged from 0.40 to 0.65 mg/l. On three days in March, 1963, the ammonia values were between 0.30 and 0.40 mg/l. During 1964, ammonia values of 0.15 to 0.47 mg/l were reported on eight days in January, six days in February and one day in March.

Additional Problems

The Gary-Hobart Water Company reports that high iron concentrations are common in the raw water supply. The average amount of the iron in the raw water is reported to be 0.15 mg/l. In January, 1963, iron results were 0.4 to 1.0 mg/l for five days. In March, 1963, iron ranged from 0.5 to 1.1 mg/l for four days. In February and March, 1964, iron values were between 0.3 and 0.5 mg/l for eight days. This iron probably comes from waste pickle liquor discharged to Indiana Harbor. The effect of this iron is to increase the cost of water treatment.

An investigation was conducted in September 1963, to determine the source of popcorn slag which fouls the Calumet Park Beach on Lake Michigan at 95th Street in Chicago. Popcorn slag is a very light, porous solid which is formed by rapid cooling of molten blast furnace slag by water jets. Some escapes the recovery facilities and is then discharged in washing or cooling water to the adjacent watercourse. The slag floats and is moved by winds and current. Thus, it frequently collects on bathing beaches, where the sulfide odor and gritty texture are both annoying and uncomfortable to bathers. This problem is a more or less continuous nuisance throughout the summer. Field investigations have indicated that at least two plants discharge this waste. The largest source of popcorn slag is the U.S. Steel, South Works, in Chicago. A lesser source is the Wisconsin Steel Works in Chicago.

IX - CORRECTIVE ACTION NEEDED

It is recommended that:

1. Industrial plants in both Indiana and Illinois take immediate steps to improve practices for exclusion or treatment of wastes, especially the following constituents:

Oil and tarry substances;

Phenolic compounds or other persistent organic chemicals that contribute to taste and odor problems;

Ammonia and other nitrogenous material;

Phosphorous;

Suspended matter; and

Highly acidic or alkaline materials.

2. Major industrial plants institute permanent programs of sampling their effluents to provide more complete information about waste outputs. Location and frequencey of sample collection should be sufficient to yield statistically reliable values of waste output and its variations. Analyses should include the following: pH, oil, tarry residues, phenolics, ammonia, organic nitrogen, total nitrogen, cyanide, toxic metals, phosphorus, suspended solids, and biochemical oxygen demand. Wastewater flows should be measured, and results should be reported in terms of

both concentrations and tonnage rates. Monthly reports of results should be submitted to the appropriate State water pollution control agencies, where they will be available in open files. Unusual increases in waste output and accident spills should be reported immediately to the State agency.

3. Appropriate State or local agencies establish system of water quality monitoring stations at strategic points in the public waters of the area. Analyses should include the indices recited above, plus dissolved oxygen, coliform and fecal streptococcus counts, and stream temperature. At selected locations and for selected indices, continuously recording monitors should be maintained and data transmitted to a central receiving office. Effective alerting procedures should be instituted by State or other appropriate agencies, for quickly informing interested parties of sudden changes or hazards to water quality.

4. The Thomas J. O'Brien Lock be closed and placed in conventional lockage operation to provide more positive control of flows and reduce the frequency and duration of backflows to Lake Michigan.

5. A dam be built across the Grand Calumet River to prevent uncontrolled flows from Lake Michigan to the Illinois River through that channel.

Preferred location of the dam is east of the outfall from the East Chicago Municipal Waste Treatment Plant.

6. All municipal wastes in the area receive secondary treatment. The trend toward consolidation of small community facilities into integrated sewer systems should be accelerated, to achieve better operation conditions and reduce the proliferation of sewage treatment plants discharging into small tributaries and dry watercourses.

7. Hammond and East Chicago investigate the feasibility of constructing lagoons for further treatment of waste effluents. Part of the existing poorly-drained floor plain of the Grand Calumet River might be utilized for this purpose, with levees around the lagoons high enough to prevent flooding, and improved bypass channels for storm drainage.

8. All sanitary wastes be disinfected before discharge. Disinfection should be practiced in the manner prescribed by State water pollution control agencies and mutually agreed upon between the two States.

Table VI-1a

SOURCES OF MUNICIPAL WASTES
LAKE MICHIGAN BASIN

Community, Sanitary District, or Institution	Receiving Stream (Direct)	Treatment	Estimated Pop. Connected to Sewer	Estimated Sewered Population Equivalent*	
				Before Treatment	Discharged
Crown Point, Ind.	Deep River	Secondary	8000	8000	1200
St. John TWP, Ind.	Turkey Cr.	Minor	3300 (a)	650	650
Lincoln Gardens, Ind.	Turkey Cr.	Secondary	1000	1000	150
Ross TWP, Ind.	Turkey Cr.	Minor	14,855 (b)	3000	3000
Hobart TWP, Ind.	Deep River	Minor	8920 (c)	1800	1800
Hobart, Ind.	Deep River	Secondary	18,680	15,000	2000
Black Oak-Ross, Ind. (d)	L. Cal. R.	Minor	6000	6000	5280
Gary, Ind. Miller Plant	Burns Ditch	Secondary	5000	4990	1750
Chesterton, Ind.	L. Cal. R.	Secondary	4335	4000	400
Porter, Ind. (e)	L. Cal. R.	Minor	1200	1200	1200
Valparaiso, Ind.	Salt Creek	Secondary	15,000	11,600	500
Eight Smaller Sources, Ind.		7 Secondary 1 Minor	6350	6050	1325
BURNS DITCH SUBTOTAL			92,640	63,290	18,755
Gary, Ind. SD Main Plant	G. Cal. R.	Secondary	174,500 (f)	299,000	18,100(g)
East Chicago, Ind.	G. Cal. R.	Secondary	57,660	53,300	6500(b)
INDIANA HARBOR SUBTOTAL			232,100	352,300	24,600
LAKE MICHIGAN TOTAL			324,740	415,590	43,355

Table VI-1b

SOURCES OF MUNICIPAL WASTES
LAKE MICHIGAN BASIN

(a) 1,000 in Illinois River basin. Remainder are served by septic tank systems with some systems operating improperly.

(b) Gary SD sewers serve 1,400. Remainder are served by septic tank systems with subsurface discharge. An undetermined amount reaches Turkey Creek.

(c) Gary SD sewers serve several hundred people. The remainder are served by septic tank systems with subsurface discharge. An undetermined amount reaches Deep River.

(d) About 17,000 in Illinois River Basin; 6,000 in Lake Michigan Basin. Due to local weather conditions and dredging operations, 0-90% of this area may drain eastward into Lake Michigan. Many septic tank systems operating improperly or systems are inadequate. Will be served by Merrillville Conservancy District.

(e) Negotiating with Chesterton to accept and treat Porter's sewage.

(f) Gary Main Plant serves all of Gary except the Miller Area. Outside Gary, a large shopping center and nearby subdivisions are also served by the main plant sewers. These include: Meadowland Estates - 700, Meadowdale - 700, and several small subdivisions. Altogether, about 1700 people outside Gary are served by the Gary SD Main Plant sewers.

(g) Also - 3810 lb/day ammonia nitrogen; 610 lb/day organic nitrogen; 30 lb/day nitrate nitrogen.

(h) Also - 640 lb/day ammonia nitrogen; 274 lb/day organic nitrogen; 377 lb/day nitrate nitrogen.

*Population Equivalent as Measured by 5-Day Biochemical Oxygen Demand

Table VI-2a

SOURCES OF MUNICIPAL WASTES
ILLINOIS RIVER BASIN

Community, Sanitary District, or Institution	Receiving Stream (Direct)	Treatment	Estimated Pop. Connected to Sewer	Estimated Sewered Population Equivalent*	
				Before Treatment	Discharged
Hammond, Ind.(a)	G. Cal. R.	Secondary	147,000	281,000	27,000(h)
Black Oak-Ross, Ind.	L. Cal. R.	Minor		17,000	15,000
Schererville, Ind.	Hart Ditch	Minor (b)	1,250	1,250	1,000
Dyer, Ind.	Hart Ditch	Minor (b)	3,600	3,600	3,000
Highland, Ind. (part) (c)	L. Cal. R.	None	5,430	5,430	4,880
Three smaller sources, Ind.		2 Secondary 1 Minor	1,600	1,250	780
Calumet Plant (MSD), Ill.(d)	L. Cal. R.	Secondary	602,400	883,000	80,000(i)
Lansing, Ill.	L. Cal. R.	Secondary	18,000	18,000	3,600
Bloom Twp. San. Dist., Ill.(e)	Thorn Creek	Secondary	68,000	77,000	16,900(j)
Steger, Ill.(f)	Third Creek	Secondary	6,400	6,400	1,300
Crete, Ill.	Deer Creek	Secondary	3,500	3,500	1,000
East Chicago Heights, Ill.	Deer Creek	Secondary	10,000	10,000	1,200
Matteson, Ill.	Butterfield Creek	Secondary	3,000	3,000	200
Flossmoore, Ill.	Butterfield Creek	Secondary	4,600	4,600	700
Homewood, Ill.	Butterfield Creek	Secondary	14,000	15,000	1,400
Washington Park Race Track, Ill.	Ditch to Thorn Cr.	Secondary	20,000	1,000	100

Table VI-2b

SOURCES OF MUNICIPAL WASTES
ILLINOS RIVER BASIN

Community, Sanitary District, or Institution	Receiving Stream (Direct)	Treatment	Estimated Pop. Connected to Sewer	Estimated Severed Population Equivalent* Before Treatment	Discharged
Southdale Subd., Ill.	Lansing Dr. Ditch	Secondary	1,200	800	100
Thornton, Ill.	Thorn Creek	Secondary	2,900	2,900	400
Hazel Crest, Ill.	Cal. Union Dr. Ditch	Secondary	6,200	6,200	600
Sundale Hills Subd., Ill.	Midlothian Creek	Secondary	1,400	1,900	200
Est. 20 smaller sources, Ill.		All Secondary	5,000	5,000	500
ILLINOIS RIVER TOTAL			942,480	1,347,830	159,860
CALUMET AREA TOTAL			1,267,220	1,763,420	203,215

Table VI-2c

SOURCES OF MUNICIPAL WASTES
ILLINOIS RIVER BASIN

(a) Includes contributions from Whiting, Munster, Griffith, and Highland (part). Improvements completed to raise capacity to 36 MGD.

(b) Sewage treatment plant under construction.

(c) Part of wastes served to Hammond. Interceptor to take 100% of wastes to Hammond, SD is under construction.

(d) Serves Alsip, Blue Crest, Blue Island, Burnham, Calumet City, Calumet Park, Canterbury Gardens, Chicago, Chicago Ridge, Dixmoor, Dolton, Evergreen Park, Garden Homes, Harvey, Hickory Hills, Markham, Meerionette Park, Midlothian, Oak Forest, Oak Lawn, Phoenix, Posen, Riverdale, Robbins, South Holland, Keystone Additions, Manor Heights Subdivision, Martin Roberts Subdivision, (Oaklawn), and South Stickney.

(e) Serves Park Forest, Chicago Heights, and South Chicago Heights.

(f) The population of Steger is divided 4,300 Hill County and 2,100 Cook County.

(g) Now being sewered for a proposed treatment plant, now partly sewered, septic tanks, etc., with large percentage discharging to Midlothian Creek.

(h) Also: 990 lb/day ammonia nitrogen; 310 lb/day organic nitrogen; 1,070 lb/day nitrate nitrogen.

(i) Also: 12,200 lb/day ammonia nitrogen; 17,500 lb/day total nitrogen; based on 1961-1962 data.

(j) Also: 850 lb/day ammonia nitrogen; 710 lb/day organic nitrogen; 34 lb/day nitrate nitrogen.

*Population Equivalent As Measured By 5-Day Biochemical Oxygen Demand

Table VI-3a

SOURCES OF INDUSTRIAL WASTES, LAKE MICHIGAN BASIN

Industry and City	Receiving Stream	Nature of Waste	Treatment Provided
	LAKE MICHIGAN SHORELINE		
N. Ind. Public Service Co. Baileytown, Indiana	L. Michigan	Ash	Settling Ponds
N. Ind. Public Service Co. Gary, Indiana	L. Michigan	Ash	Settling Ponds
Universal Atlas Cement Co. Gary, Indiana	L. Michigan	Domestic	Secondary
Union Carbide Chemicals Co. Whiting, Indiana	L. Michigan	Petrochemical	Some recirculation
American Oil Company Whiting, Indiana	L. Michigan	Petroleum refinery	Oil separators Secondary
American Maize-Products Co. Hammond, Indiana	L. Michigan	Corn starch	Lagoon, inplant control
Commonwealth Edison Co. State Line Station Hammond, Indiana	L. Michigan	Fly ash, slag	Dewatering bins
U.S. Steel Corp., So. Works Chicago, Illinois	L. Michigan	Basic steel	Flue dust clairifier
Bethlehem Steel Corporation Chesterton, Indiana	L. Cal. R.	Rolling mill Domestic	Scale pits, Flocculation-Clairification
Midwest Steel Division National Steel Corporation Portage, Indiana	Burns Ditch	Rolling mill Domestic	Scale pits, Flocculation Clairification, Secondary Chlorination

Table VI-3b

SOURCES OF INDUSTRIAL WASTES, LAKE MICHIGAN BASIN

Industry and City	Receiving Stream	Nature of Waste	Treatment Provided
	GRAND CALUMET RIVER - INDIANA HARBOR CANAL		
U.S. Steel Corporation* Gary Works Gary, Indiana	G. Cal. R.	Basic steel Coke	Phenol quenched pickle liquor absorption lagoon, oil recovery pits flue dust-partial recovery
U.S. Steel Corporation Gary Sheet & Tin Mill Gary, Indiana	G. Cal. R.		
Steiner Tissue Mill Gary, Indiana	G. Cal. R.	Paper	Save-alls
Berry Refining Co. Gary, Indiana	No discharge		Oil separator & impounding basin
Cities Service Petroleum Co. East Chicago, Indiana	G. Cal. R.	Petroleum Refinery	Oil separators, sulfide & ammonia stripper, caustic neutralization
E. I. DuPont de Menours & Co. East Chicago, Indiana	G. Cal. R.	Inorganic Chemicals	Controlled discharge facilities, acid neutralization
Blaw Know Company East Chicago, Indiana	Indiana Harbor Canal		Settling tanks & filters
General American Transportation Company East Chicago, Indiana	Indiana Harbor Canal	Tank car washing	Pond, settling basin, oil separator, pH control, chemical treatment
Linde Air Products Co. East Chicago, Indiana	Indiana Harbor Canal	Cooling water	
American Oil Company Hammond, Indiana	L. George Br.	Petroleum refinery	

Table VI-3c

SOURCES OF INDUSTRIAL WASTES, LAKE MICHIGAN BASIN

Industry and City	Receiving Stream	Nature of Waste	Treatment Provided
	GRAND CALUMET RIVER - INDIANA HARBOR CANAL		
Calumet Nitrogen Products Co. Hammond, Indiana	L. George Br.	Synthetic ammonia	Holding pond
Union Tank Car Company Hammond, Indiana	L. George Br.	Tank car washing	Chemical oil separation basins
Sinclair Refining Company East Chicago, Indiana	L. George Br.	Petroleum refinery	Oil separators, cooling towers, ammonia-sulfide stripper, sulfide oxidation, caustic treatment, phenolic waters routed through desalters
East Chicago Storm Sewer East Chicago, Indiana	L. George Br.	Industrial	
Mobil Oil Company East Chicago, Indiana	L. George Br.	Petroleum refinery	Oil separation, cooling towers, straw filters, sulfide & ammonia strippers under construction. Stripper waters will be through desalters for phenol reduction
U.S. Gypsum Company East Chicago, Indiana	Indiana Harbor Canal	Gypsum & ~~paper~~ PAPER	None
Youngstown Sheet & Tube Co. East Chicago, Indiana	Indiana Harbor Canal	Basic steel Coke	Phenol & pickle liquor recovery, thickeners, oily waste treatment, scale pits
Inland Steel Company East Chicago, Indiana	Indiana Harbor Canal	Basic steel Coke	Phenols & naphalene recovery, coke plant cooling waters, recirculation, scale pits

Table VI - 3d

SOURCES OF INDUSTRIAL WASTES, LAKE MICHIGAN BASIN

Industry and City	Receiving Stream	Nature of Waste	Treatment Provided
	GRAND CALUMET RIVER - INDIANA HARBOR CANAL		
Adolph Plating, Inc. East Chicago, Indiana	G. Cal. R.	Plating	
U.S.S. Lead Refinery, Inc. East Chicago, Indiana	G. Cal. R.		
American Steel Foundries East Chicago, Indiana	Indiana Harbor Canal		

* Also includes U.S. Steel Corporation National Tube Division and American Bridge Division, Gary, Indiana.

Table VI-4a

SOURCES OF INDUSTRIAL WASTES, ILLINOIS RIVER BASIN

Industry and City	Receiving Stream	Nature of Waste	Treatment Provided
Commonwealth Edison Company Calumet Station Chicago, Illinois	Calumet R.		
Wisconsin Steel Works Chicago, Illinois	Calumet R.	Flue dust, some neutralized pickle liquor, coke breeze	Thickener, neutralization
Interlake Iron Corporation Chicago, Illinois	Calumet R.	Some coke wastes, flue dust	Thickeners, closed coke quench
Republic Steel Corporation Chicago, Illinois	Calumet R.	Flue dust, pickle liquor	Thickeners, scale pits
Lever Brothers Company Hammond, Indiana	Wolf Lake	Soap, fats	Air flotation, chlorination
Allied Chemical Company Chicago, Illinois	Calumet R.	Inorganic chemicals	
Cargill, Inc. Chicago, Illinois	Calumet R.	Soybean oil	Neutralization, treatment plant under construction
Ford Motor Company Chicago, Illinois	Calumet R.	Paint, alkali, chromium	Filtration, treatment plant under construction
LaSalle Steel Company Hammond, Indiana	G. Cal. R.	Some pickle liquor	Acid neutralization
Swift & Company Burnham, Illinois	G. Cal. R.	Fertilizer	
Catalin Corporation Calumet City, Illinois	L. Cal. R.	Phenolics	None
Spencer Chemical Company Calumet City, Illinois	L. Cal. R.		
Acme Steel Corporation Riverdale, Illinois	L. Cal. R.	Raw sewage mill scale, pickle liquor	Thickener, scale pits, oil separation

Table VI-4b

SOURCES OF INDUSTRIAL WASTES, ILLINOIS RIVER BASIN

Industry and City	Receiving Stream	Nature of Waste	Treatment Provided
State Street Ditch Chicago Heights, Ill.	Thorn Creek	Phosphate	
Simmons Company Munster, Indiana	L. Cal. R.	Plating	Alkaline chlorination of cyanide, reductic of chromate

Table VI-5a

QUANTITIES OF INDUSTRIAL WASTE, LAKE MICHIGAN BASIN

Industry and City	Discharge MGD	PE (5 Day BOD Basis)	Pounds Per Day Ammonia Nitrogen	Pounds Per Day Total Nitrogen	Pounds Per Day Phenolics	Pounds Per Day Cyanide	Pounds Per Day Oil	Pounds Per Day Other
N. Ind. Public Service Co. Baileytown, Indiana	425							
N. Ind. Public Service Co. Gary, Indiana	432							
Universal Atlas Cement Co. Gary, Indiana								
Union Carbide Chemical Co. Whiting, Indiana	43	99,000			13		0	
American Oil Company Whiting, Indiana	97	57,000	3,815	4,800	1,088		3,951	
American Maize-Products Co. Hammond, Indiana	8.6	44,000						
Commonwealth Edison Co. State Line Station Hammond, Indiana	700							
U.S. Steel Corp., So. Works Chicago, Illinois			990	860	250	60	7,700	
Betnlehem Steel Corporation Chesterton, Indiana		Recently began operations, no data available						
Midwest Steel Div., National Steel Corporation Portage, Indiana	2.6	400						

Table VI-5b

QUANTITIES OF INDUSTRIAL WASTES, LAKE MICHIGAN BASIN

Industry and City	Discharge MGD	PE (5 Day BOD Basis)	Pounds Per Day					
			Ammonia Nitrogen	Total Nitrogen	Phenolics	Cyanide	Oil	Other
U.S. Steel Corp. Gary Works Gary, Indiana	330	266,000	13,750	17,400	1,500	1,700	54,000	
U.S. Steel Corporation Gary Sheet & Tin Mill Gary, Indiana								
Steiner Tissue Mill Gary, Indiana	1.85	26,000						
Berry Refining Co. Gary, Indiana	None							
Cities Service Petroleum Co. East Chicago, Indiana	80	47,400	1,140	1,580	130		4,040	
E. I. DuPont de Menours & Co. East Chicago, Indiana	10.8	10,000(a)						9500 lb/day sulfur dioxide
Blaw Knox Co. East Chicago, Indiana	0.9	360	8	11			83	
General American Transportation Company East Chicago, Indiana								
Linde Air Products Co. East Chicago, Indiana	0.5	60	3	68			27	

(a) Estimated equivalent of 9500 pounds per day sulfur dioxide

Table VI-5c

QUANTITIES OF INDUSTRIAL WASTES, LAKE MICHIGAN BASIN

Industry and City	Discharge MGD	PE (5 Day BOD Basis)	Pounds Per Day					
			Ammonia Nitrogen	Total Nitrogen	Phenolics	Cyanide	Oil	Other
American Oil Co. Hammond, Indiana	0.14	2,340	20	100	170		40	
Calumet Nitrogen Products Co. Hammond, Indiana	1.0	200	1,140	1960(b)			330	
Union Tank Car Co. Hammond, Indiana	0.2	400						
Sinclair Refining Co. East Chicago, Indiana	3.8	4,740	130	200	190		290	
East Chicago Storm Sewer East Chicago, Indiana	0.6	14,820	40	160	40		1,400	
Mobil Oil Company East Chicago, Indiana	3.9	12,400	1,130	1,200	780		Not det.	
U.S. Gypsum Company East Chicago, Indiana	0.18	30					18	Susp. solids 187 lb/day sampled during strike
Youngstown Sheet & Tube Co. East Chicago, Indiana	250	100,200	4,090	6,000	250	250	18,900	Some pickle liquor
Inland Steel Company East Chicago, Indiana	480	199,800	16,800	21,000	620	940	24,800	pickle liquor

(b) Sewer from ammonium nitrate plant has been connected to Hammond Sanitary District System. Effectiveness of treatment not determined. Estimated present discharge 0.8 MGD.

Table VI-6a

QUANTITIES OF INDUSTRIAL WASTES, ILLINOIS RIVER BASIN

Industry and City	Discharge MGD	PE (5 Day BOD Basis)	Pounds Per Day					
			Ammonia Nitrogen	Total Nitrogen	Phenolics	Cyanide	Oil	Other
Commonwealth Edison Co. Calumet Station Chicago, Illinois	220							
Wisconsin Steel Works Chicago, Illinois	40	2,200	100		10		800	
Interlake Iron Corp. Chicago, Illinois	37	20,300	700		900		260	
Republic Steel Corp. Chicago, Illinois	85	0	0		80			
Lever Brothers Co. Hammond, Indiana	10	18,000						
Allied Chemical Company Chicago, Illinois	4	4,200						
Cargill, Inc. Chicago, Illinois	0.4	8,700					590	
Ford Motor Company	0.5	3,000						
LaSalle Steel Company Hammond, Indiana								
Swift & Company Burnham, Illinois								
Catalin Corporation Calumet City, Illinois	1.5	1,800			90			

Table VI-6b

QUANTITIES OF INDUSTRIAL WASTES, ILLINOIS RIVER BASIN

Industry and City	Discharge MGD	PE (5 Day BOD Basis)	Pounds Per Day					
			Ammonia Nitrogen	Total Nitrogen	Phenolics	Cyanide	Oil	Other
Spencer Chemical Co. Calumet City, Illinois		0						
Acme Steel Corporation Riverdale, Illinois	48	5,000						raw sewage
State Street Ditch Chicago Heights, Ill.	8	4,300	90				900	3,300 lb/day* phosphate
Simmons Company Munster, Indiana	0.3							

*Including Victor Chemical Company's share of discharge from Sanitary District of Bloom Township

Table VI-7

Public Health Service Grants for Construction of Waste Treatment Facilities

Municipality	Date Offered or Approved	Amount	Estimated Total Cost of Project	Status of Project
INDIANA				
Dyer	9/5/63	$250,000	$ 977,000	Under construction
Griffith	9/11/61	250,000	1,519,000	Essentially in operation
Hammond S.D. (STP)	9/20/62	250,000	3,500,000	
Hammond S.D. (Munster Interc)	10/19/62	243,000	810,000	
Highland	10/10/63	229,500	765,000	Contracts awarded
Hobart	10/19/60	250,000	1,043,200	In operation
Schererville	10/24/63	245,970	819,000	Under construction
Merrillville (Conservancy District)	1/6/65	181,740	605,800	Offer made
ILLINOIS				
Thornton	3/5/58	32,880	112,800	In operation
Lansing	4/2/57	204,830	682,800	In operation

Table VIII-1 - SUMMARY OF RAW WATER PROBLEMS

CHICAGO SOUTH DISTRICT FILTRATION PLANT, 1963-4

Time Period	Threshold Odor* Average Maximum Crib	Threshold Odor* Average Maximum Shore	Prevalent Odors	Carbon Dosage pound per MG Av. Max.
1963				
Jan. 24-Feb. 7	14	9	hydrocarbon disagreeable musty septic	266
March 3-4	9	6	hydrocarbon disagreeable musty chemical	208
April 2-7	8	6	hydrocarbon disagreeable musty chemical	148
1964				
Dec. 11-12	55	11	hydrocarbon	532
Dec. 22-31	6	5	hydrocarbon disagreeable musty, fishy septic, moldy	130

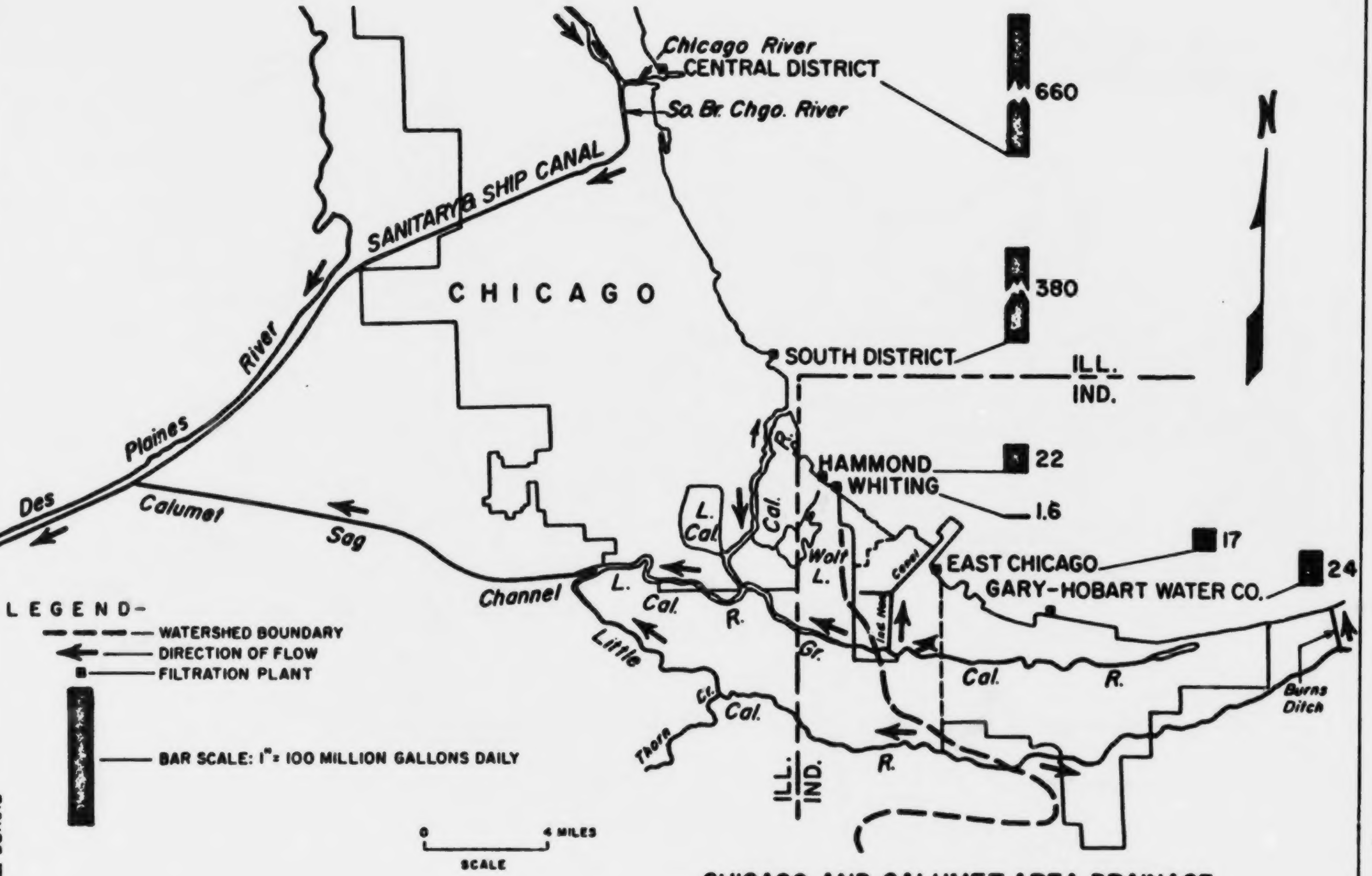
*Public Health Service Drinking Water Standards is a maximum of 3.

Table VIII-2

ORGANIC CONCENTRATIONS AT CHICAGO AND VICINITY WATER INTAKES
Results in micrograms per liter

	Average	Maximum	Minimum
Whiting, Indiana			
CCE	146	242	67
CAE	169	212	132
Total	308	442	187
South District Filtration Plant			
CCE	46	76	18
CAE	162	262	103
Total	208	315	138
Chicago Avenue			
CCE	53	97	35
CAE	165	227	93
Total	218	294	147
Evanston, Illinois			
CCE	47	71	29
CAE	162	230	90
Total	209	287	146
Waukegan, Illinois			
CCE	42	66	14
CAE	156	198	90
Total	197	290	121

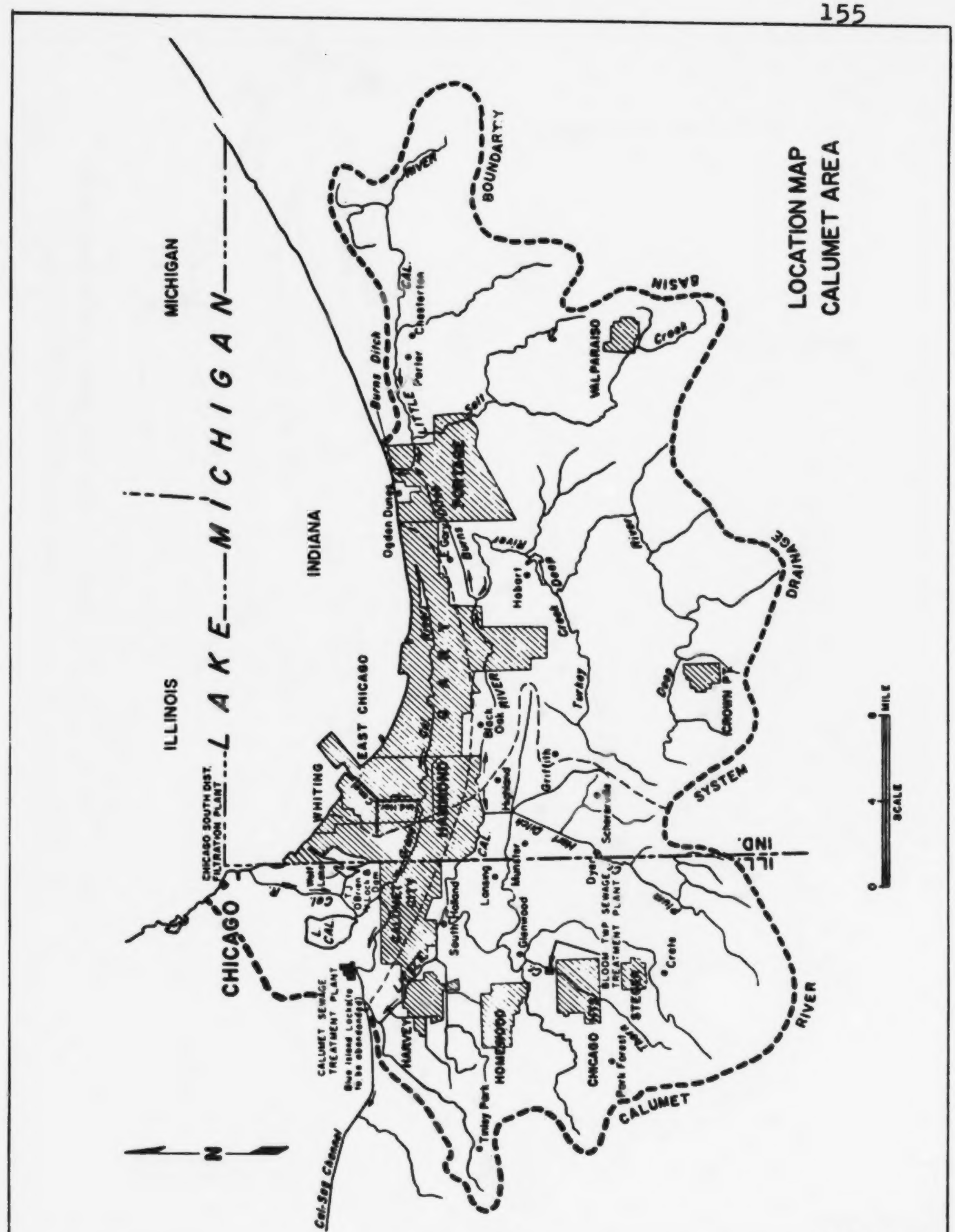
CCE Carbon chloroform extract
CAE Carbon alcohol extract


Chicago River
CENTRAL DISTRICT
So. Br. Chgo. River
660
SANITARY & SHIP CANAL
CHICAGO
380
SOUTH DISTRICT
ILL.
IND.
N
Des Plaines River
Calumet Sag Channel
HAMMOND
22
WHITING
1.6
L. Cal.
Cal.
R.
Wolf L.
Ind. Har. Canal
EAST CHICAGO
17
GARY-HOBART WATER CO.
24
L. Cal. R.
Little Cal. R.
Gr.
Cal. R.
Thorn Cr.
Burns Ditch
ILL.
IND.
LEGEND-
WATERSHED BOUNDARY
DIRECTION OF FLOW
FILTRATION PLANT
BAR SCALE: 1" = 100 MILLION GALLONS DAILY
0
4 MILES
SCALE

CHICAGO AND CALUMET AREA DRAINAGE AND MUNICIPAL WATER SUPPLIES

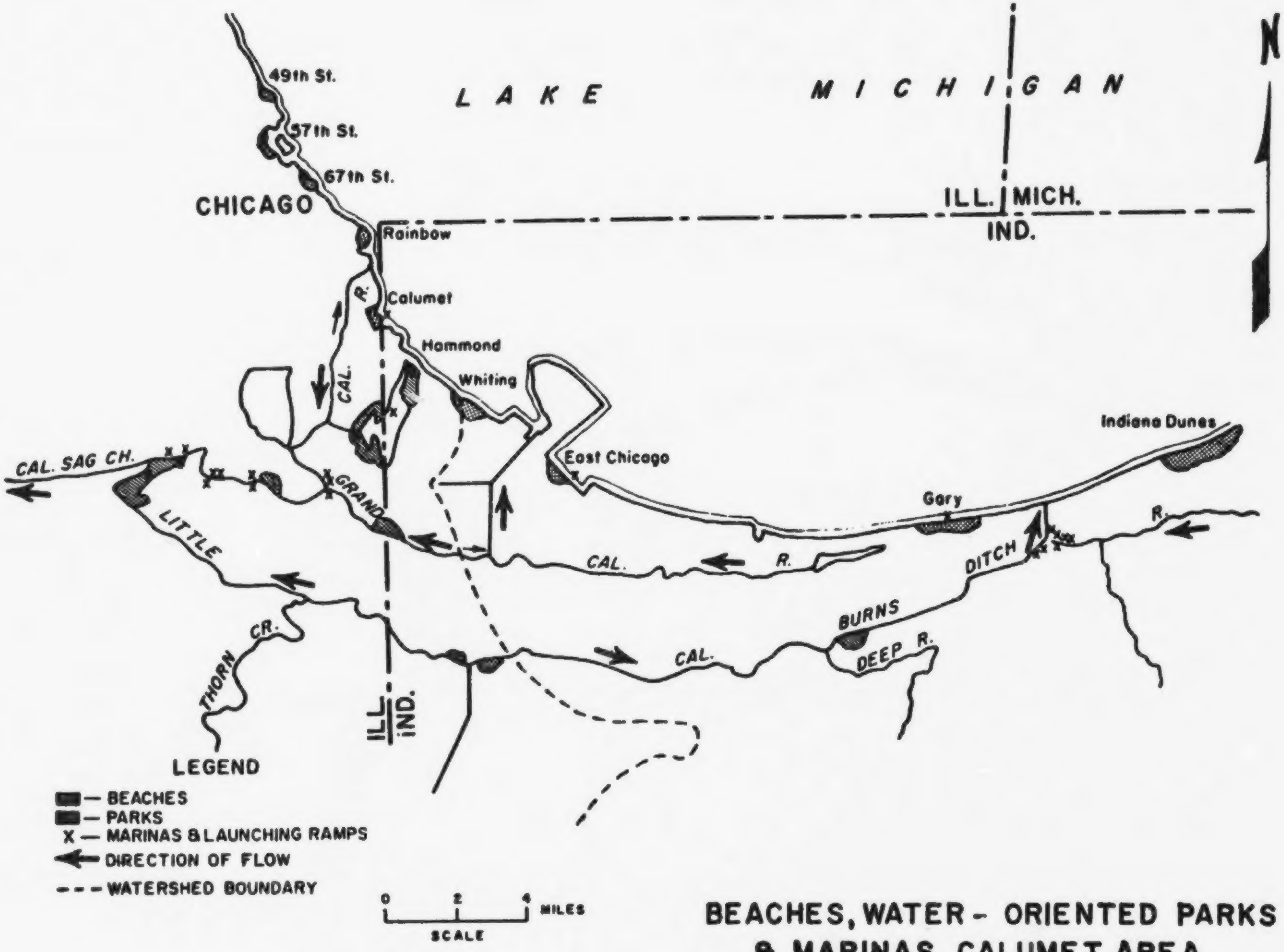
FIGURE IV-1

GPO 816-151-6


N
CHICAGO
ILLINOIS
MICHIGAN
INDIANA
LAKE MICHIGAN
CHICAGO SOUTH DIST. FILTRATION PLANT
CALUMET SEWAGE TREATMENT PLANT
Blue Island Lock (to be abandoned)
Cal-Sag Channel
L. CAL.
T.J. O'Brien Lock & Dam
WHITING
EAST CHICAGO
HAMMOND
GARY
PORTAGE
Ogden Dunes
Burns Ditch
LITTLE CAL. RIVER
Porter
Chesterton
Salt Creek
VALPARAISO
Hobart
Deep River
Turkey Creek
Black Oak
Highland
Griffith
Schererville
Hart Ditch
Munster
Dyer
Lansing
Glenwood
South Holland
CALUMET CITY
HARVEY
HOMEWOOD
Tinley Park
CHICAGO HTS.
BLOOM TWP SEWAGE TREATMENT PLANT
STEGER
Park Forest
Crete
Thorn Creek
CROWN PT.
ILL.
IND.
CALUMET RIVER SYSTEM DRAINAGE BASIN BOUNDARY
SCALE
0
4
8
MILE

LOCATION MAP
CALUMET AREA

FIGURE IV-2

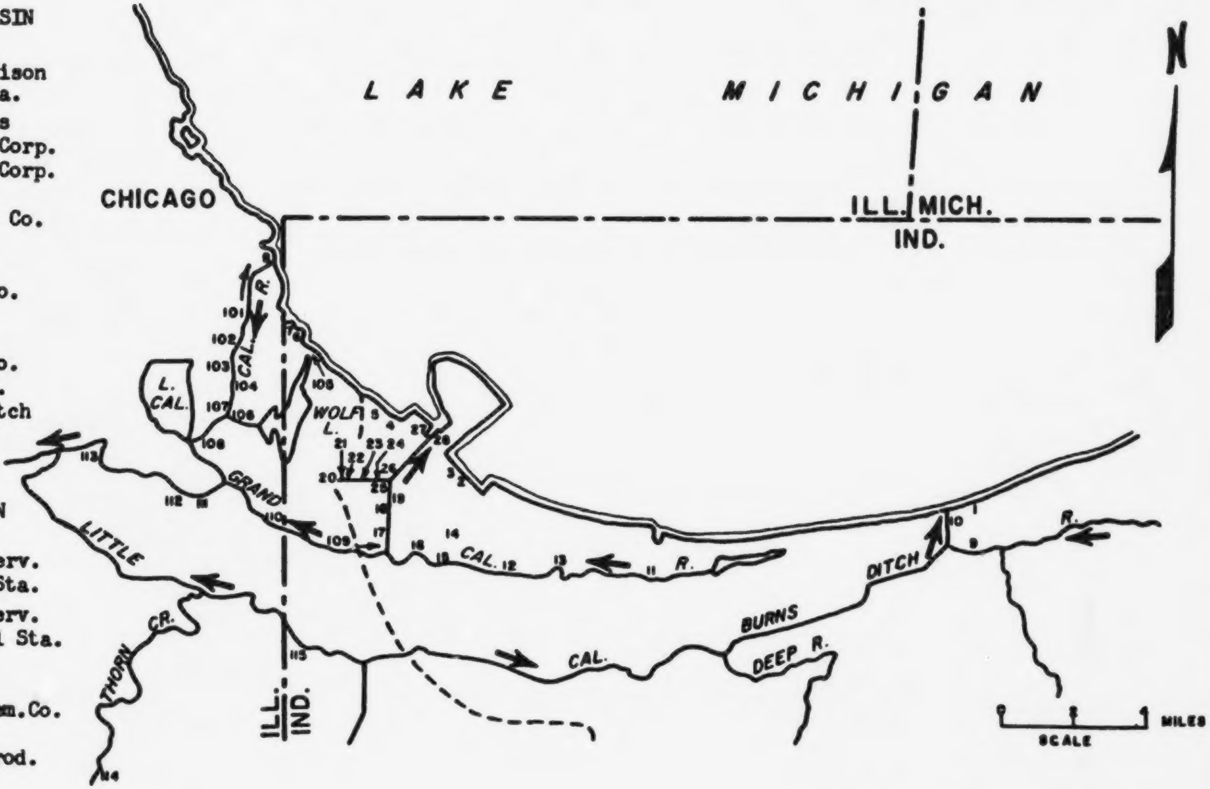

LAKE MICHIGAN
N
ILL. MICH.
IND.
49th St.
57th St.
67th St.
CHICAGO
Rainbow
Calumet
Hammond
Whiting
East Chicago
Gary
Indiana Dunes
CAL. R.
CAL. SAG CH.
LITTLE
GRAND
CAL.
CAL. R.
R.
DITCH
BURNS
DEEP R.
CAL.
THORN CR.
ILL.
IND.
LEGEND
— BEACHES
— PARKS
X — MARINAS & LAUNCHING RAMPS
DIRECTION OF FLOW
--- WATERSHED BOUNDARY
0
2
4
MILES
SCALE

BEACHES, WATER - ORIENTED PARKS & MARINAS, CALUMET AREA

FIGURE V-1

ILLINOIS RIVER BASIN

101 Commonwealth Edison Co., Calumet Sta.
102 Wis. Steel Works
103 Interlake Iron Corp.
104 Republic Steel Corp.
105 Lever Bros. Co.
106 Allied Chemical Co.
107 Cargill, Inc.
108 Ford Motor Co.
109 LaSalle Steel Co.
110 Swift & Co.
111 Catalin Corp.
112 Spencer Chem. Co.
113 Acme Steel Corp.
114 State Street Ditch
115 Simmons Company


LAKE MICHIGAN
N
CHICAGO
ILL. MICH.
IND.
ILL.
IND.
L. CAL.
CAL. R.
WOLF L.
GRAND
LITTLE
CAL.
THORN CR.
CAL. R.
BURNS
DITCH
DEEP R.
R.
SCALE
0 2 MILES
101
102
103
104
105
106
107
108
109
110
111
112
113
114
115
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28

LAKE MICHIGAN BASIN

1. N. Ind. Public Serv. Co., Baileytown Sta.
2. N. Ind. Public Serv. Co.,Dean Mitchell Sta.
3. Universal Atlas Cement Company
4. Union Carbide Chem.Co.
5. American Oil Co.
6. American Maize-Prod. Co.
7. Comm. Edison Co,, State Line Station
8. U.S. Steel Corp., South Works
9. Bethlehem Steel Corp.
10. Midwest Steel Div.
11. U.S. Steel Corp., Gary Steel Works
12. U.S. Steel Corp., Gary Sheet & Tin Mill
13. Steiner Tissue Mill
14. Berry Refining Co.
15. Cities Serv. Petro.Co.
16. E.I. duPont deNemours & Co.
17. Blaw Knox Co.
18. Gen.Amer.Trans.Co.
19. Linde Air Prod.Co.
20. American Oil Co.
21. Calumet Nit.Prod.Co.
22. Union Tank Car Co.
23. Sinclair Refining Co.
24. East Chicago Storm Sewer
25. Mobil Oil Company
26. U.S. Gypsum Company
27. Youngstown Sheet & Tube Co.
28. Inland Steel Company

← DIRECTION OF FLOW
- - - WATERSHED BOUNDARY

FIGURE XI-1

PRINCIPAL SOURCES OF INDUSTRIAL WASTES

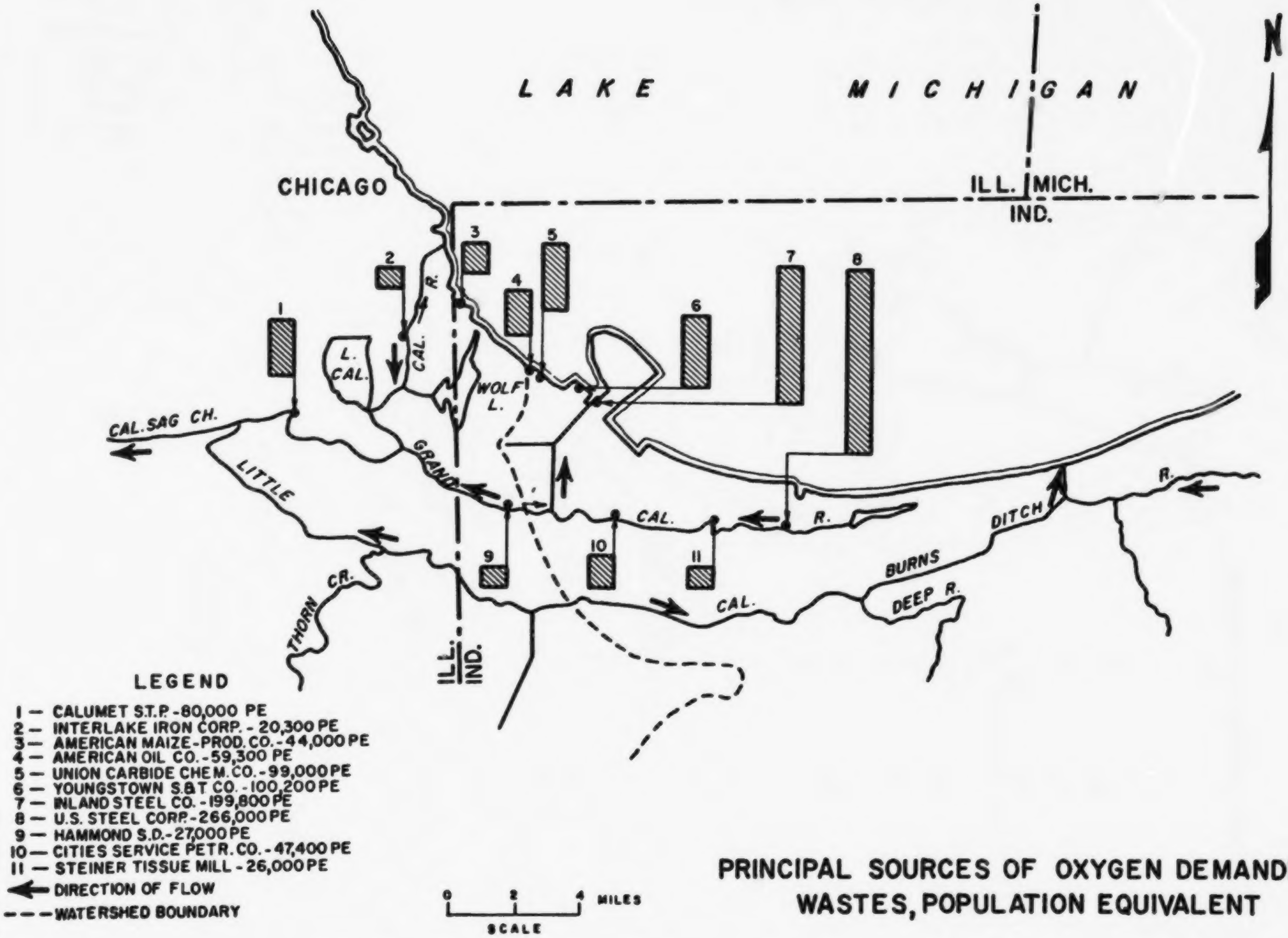
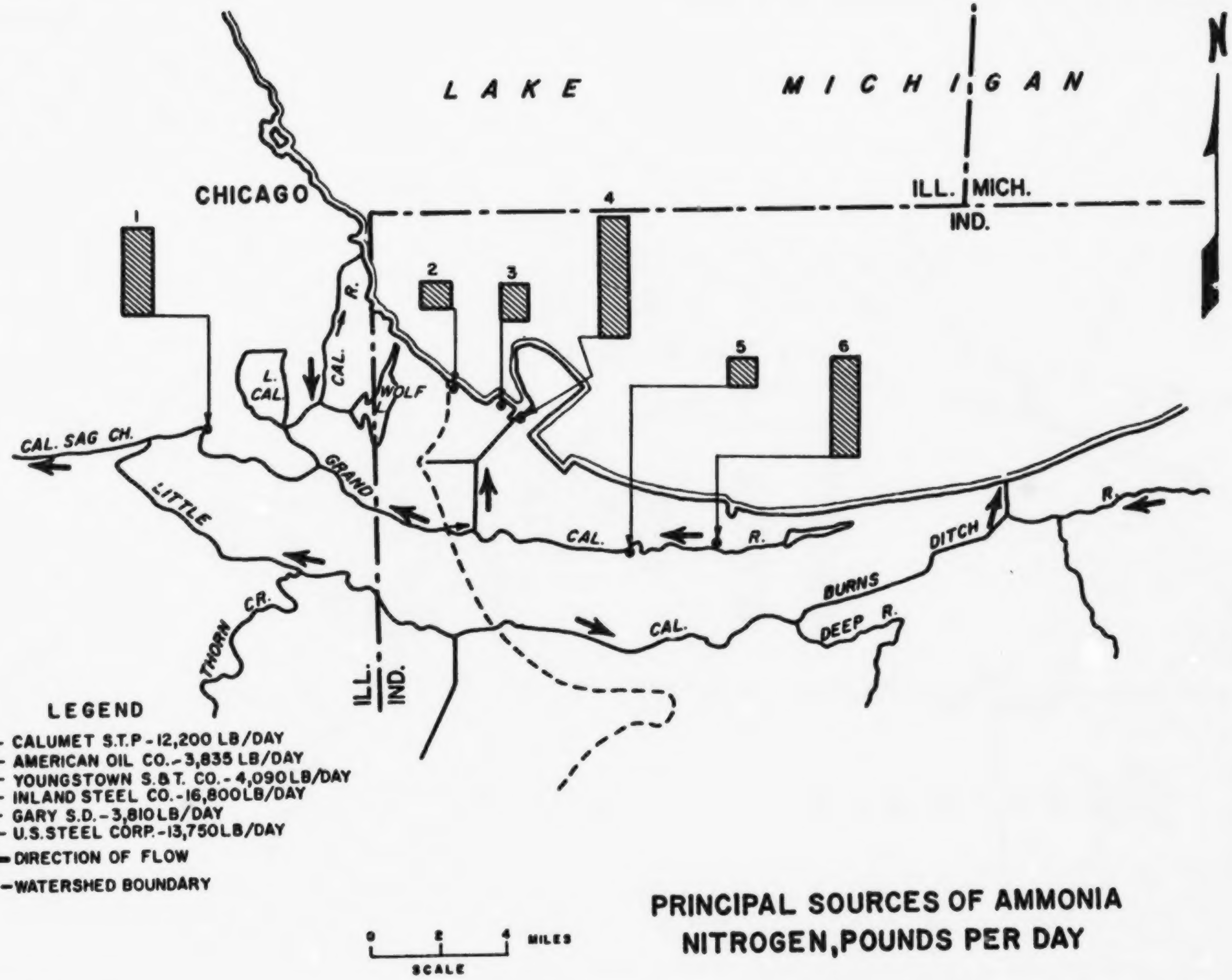

LAKE MICHIGAN
N
CHICAGO
ILL. MICH.
IND.
ILL.
IND.
1
2
3
4
5
6
7
8
9
10
11
L. CAL.
CAL. R.
WOLF L.
CAL. SAG CH.
LITTLE
GRAND
CAL.
R.
THORN CR.
CAL.
BURNS
DITCH
DEEP R.
R.
LEGEND
1 — CALUMET S.T.P. - 80,000 PE
2 — INTERLAKE IRON CORP. - 20,300 PE
3 — AMERICAN MAIZE-PROD. CO. - 44,000 PE
4 — AMERICAN OIL CO. - 59,300 PE
5 — UNION CARBIDE CHEM. CO. - 99,000 PE
6 — YOUNGSTOWN S.&T CO. - 100,200 PE
7 — INLAND STEEL CO. - 199,800 PE
8 — U.S. STEEL CORP. - 266,000 PE
9 — HAMMOND S.D. - 27,000 PE
10 — CITIES SERVICE PETR. CO. - 47,400 PE
11 — STEINER TISSUE MILL - 26,000 PE
DIRECTION OF FLOW
WATERSHED BOUNDARY
0
2
4 MILES
SCALE

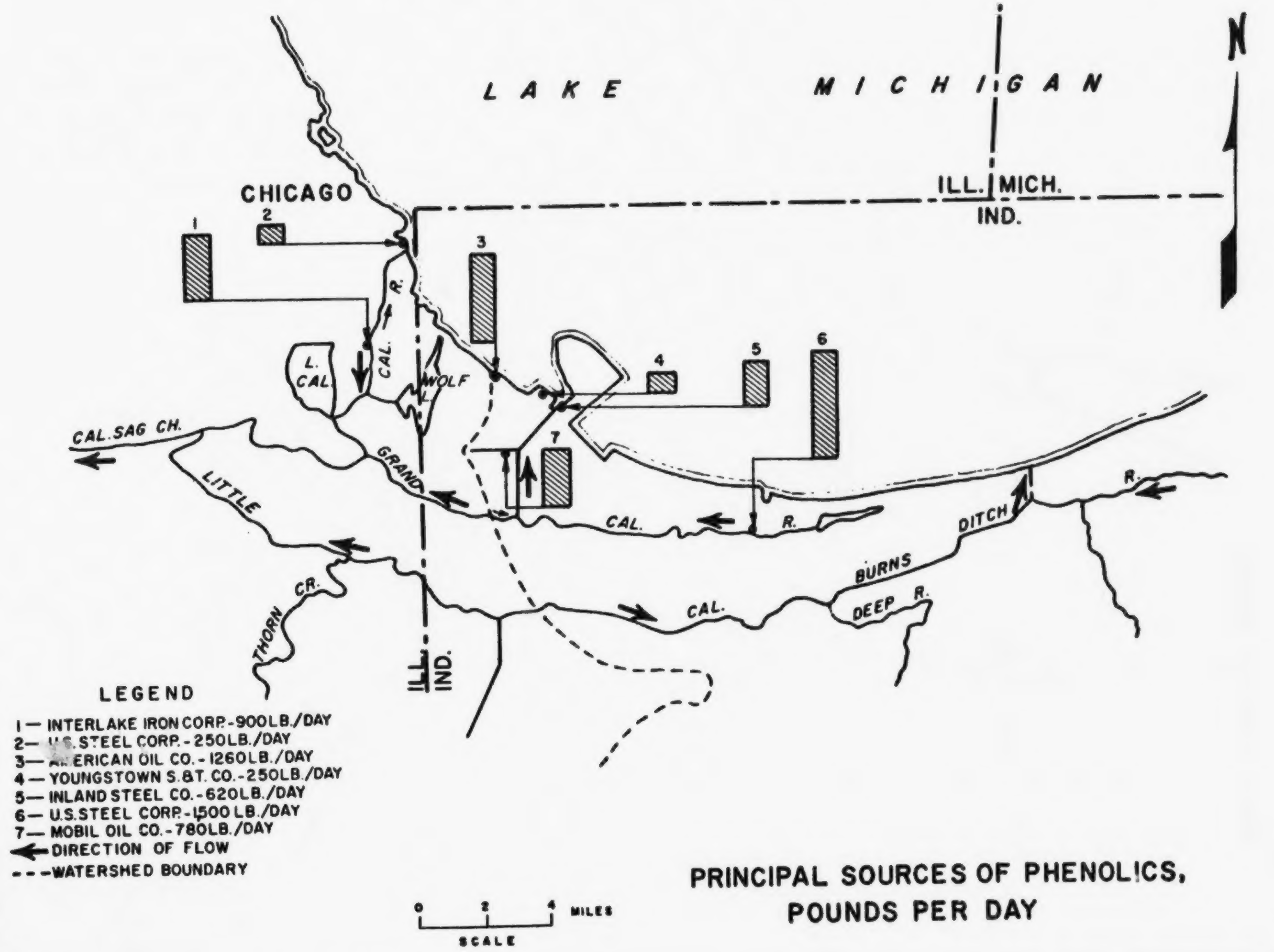
FIGURE VI-2

PRINCIPAL SOURCES OF OXYGEN DEMANDING WASTES, POPULATION EQUIVALENT


LAKE MICHIGAN
N
ILL. MICH.
IND.
CHICAGO
1
2
3
4
5
6
L. CAL.
CAL. R.
WOLF
CAL. SAG CH.
LITTLE
GRAND
CAL.
R.
BURNS
DITCH
DEEP R.
CAL.
THORN CR.
R.
ILL.
IND.
LEGEND
1 — CALUMET S.T.P.-12,200 LB/DAY
2 — AMERICAN OIL CO.-3,835 LB/DAY
3 — YOUNGSTOWN S.&T. CO.-4,090 LB/DAY
4 — INLAND STEEL CO.-16,800 LB/DAY
5 — GARY S.D.-3,810 LB/DAY
6 — U.S. STEEL CORP.-13,750 LB/DAY
DIRECTION OF FLOW
WATERSHED BOUNDARY
0 2 4 MILES
SCALE

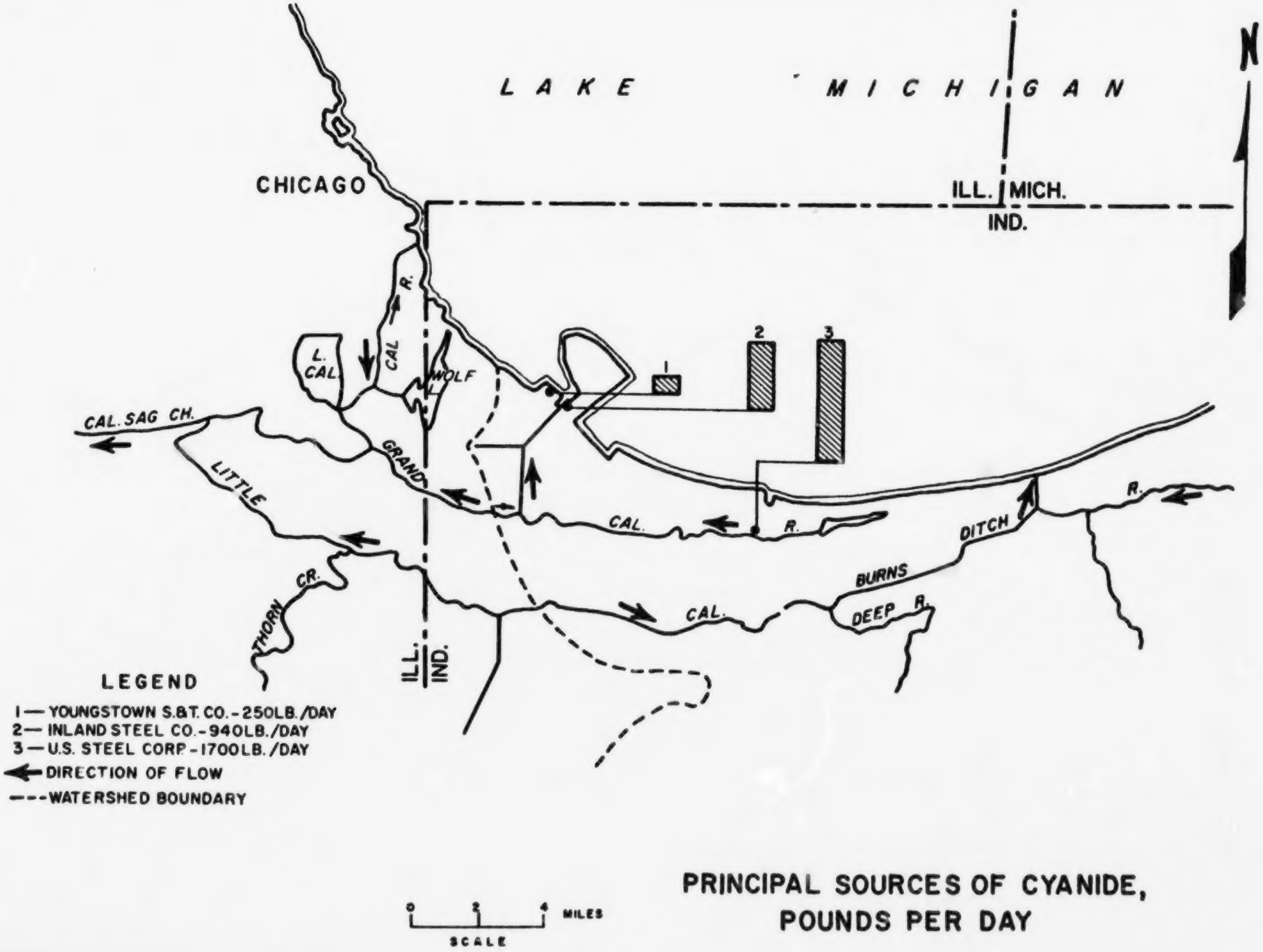
PRINCIPAL SOURCES OF AMMONIA NITROGEN, POUNDS PER DAY

FIGURE VI-3


LAKE MICHIGAN
N
ILL. MICH.
IND.
CHICAGO
1
2
3
4
5
6
7
CAL. R.
L. CAL.
WOLF L.
CAL. SAG CH.
GRAND CAL. R.
LITTLE CAL.
THORN CR.
BURNS DITCH
DEEP R.
R.
ILL.
IND.
LEGEND
1— INTERLAKE IRON CORP.-900LB./DAY
2— U.S. STEEL CORP.-250LB./DAY
3— AMERICAN OIL CO.-1260LB./DAY
4— YOUNGSTOWN S.&T. CO.-250LB./DAY
5— INLAND STEEL CO.-620LB./DAY
6— U.S. STEEL CORP.-1500 LB./DAY
7— MOBIL OIL CO.-780LB./DAY
DIRECTION OF FLOW
- - -WATERSHED BOUNDARY
0
2
4
MILES
SCALE

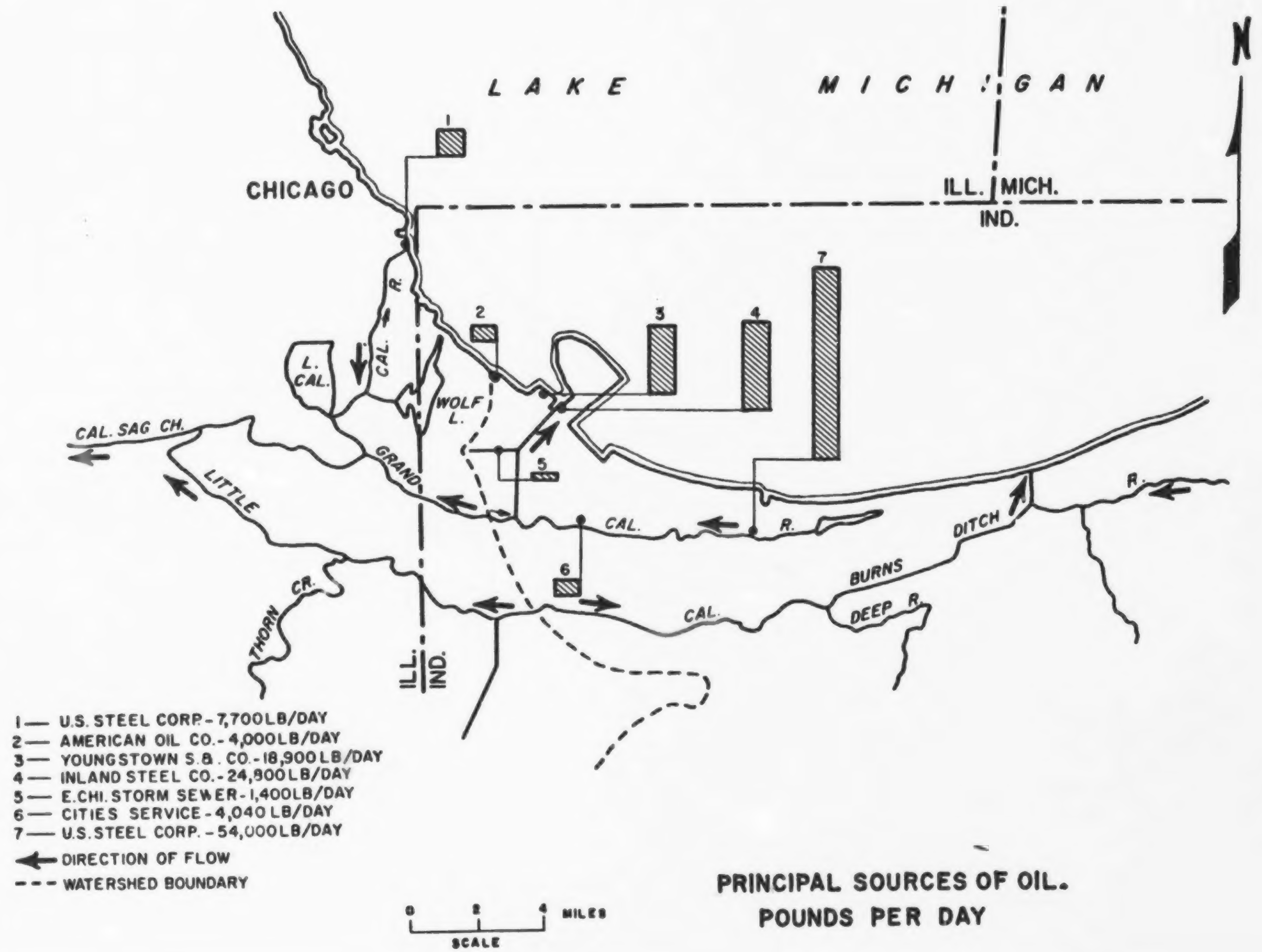
PRINCIPAL SOURCES OF PHENOLICS, POUNDS PER DAY

FIGURE VI-4


LAKE MICHIGAN
N
CHICAGO
ILL.
MICH.
IND.
ILL.
IND.
1
2
3
L. CAL.
CAL. R.
WOLF L.
CAL. SAG CH.
LITTLE
GRAND
CAL.
CAL. R.
THORN CR.
CAL.
BURNS
DITCH
DEEP R.
R.
LEGEND
1 — YOUNGSTOWN S.&T. CO. - 250LB./DAY
2 — INLAND STEEL CO. - 940LB./DAY
3 — U.S. STEEL CORP. - 1700LB./DAY
DIRECTION OF FLOW
WATERSHED BOUNDARY
0
2
4
MILES
SCALE

PRINCIPAL SOURCES OF CYANIDE, POUNDS PER DAY

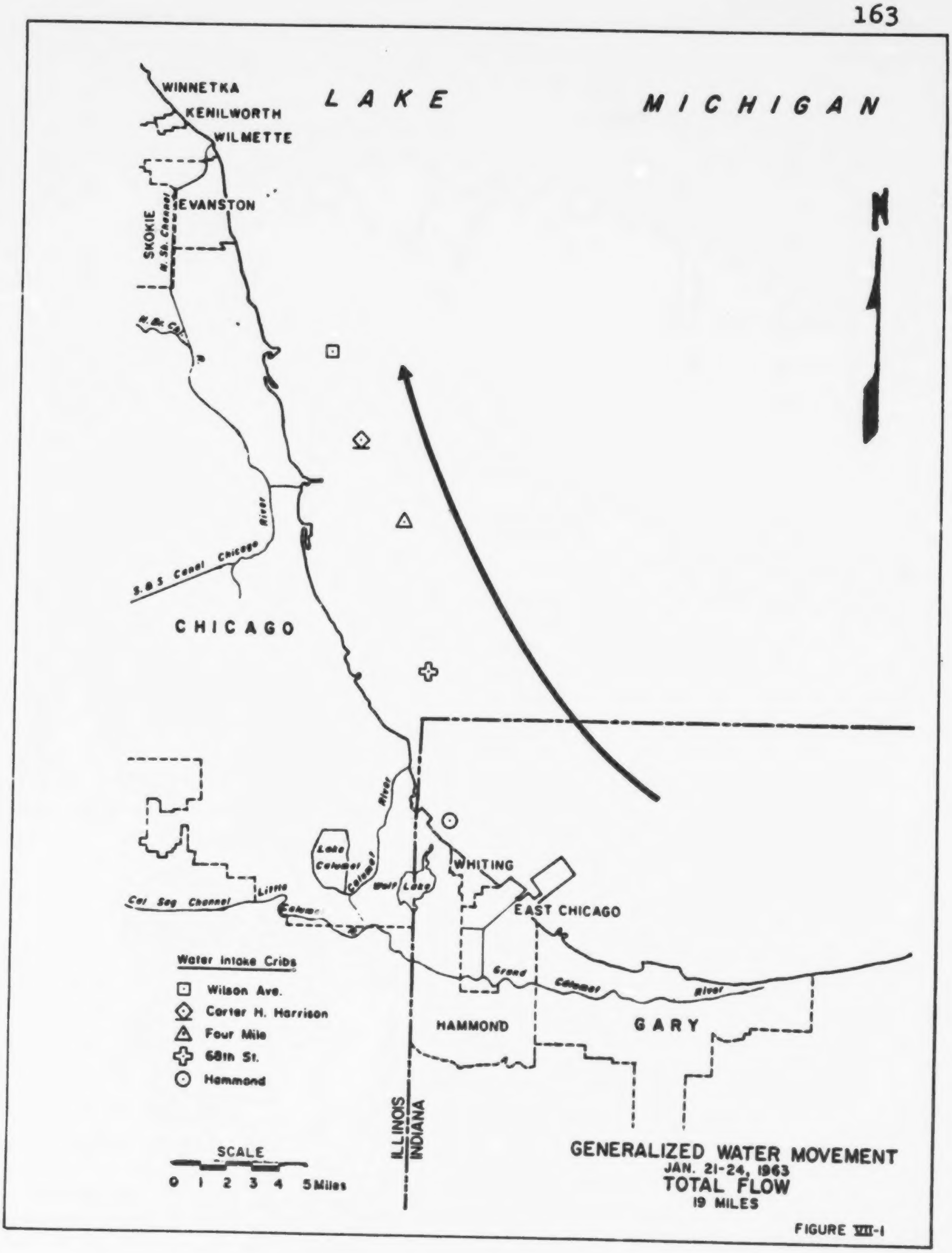
FIGURE VI-5


LAKE MICHIGAN
N
ILL.
MICH.
IND.
CHICAGO
1
2
3
4
5
6
7
L. CAL.
CAL. R.
WOLF L.
CAL. SAG CH.
LITTLE
GRAND
CAL.
R.
CAL.
BURNS
DITCH
DEEP R.
R.
THORN CR.
ILL.
IND.
1— U.S. STEEL CORP. - 7,700 LB/DAY
2— AMERICAN OIL CO. - 4,000 LB/DAY
3— YOUNGSTOWN S.&. CO. - 18,900 LB/DAY
4— INLAND STEEL CO. - 24,800 LB/DAY
5— E.CHI. STORM SEWER - 1,400 LB/DAY
6— CITIES SERVICE - 4,040 LB/DAY
7— U.S. STEEL CORP. - 54,000 LB/DAY
DIRECTION OF FLOW
WATERSHED BOUNDARY
0
2
4
MILES
SCALE

PRINCIPAL SOURCES OF OIL.
POUNDS PER DAY

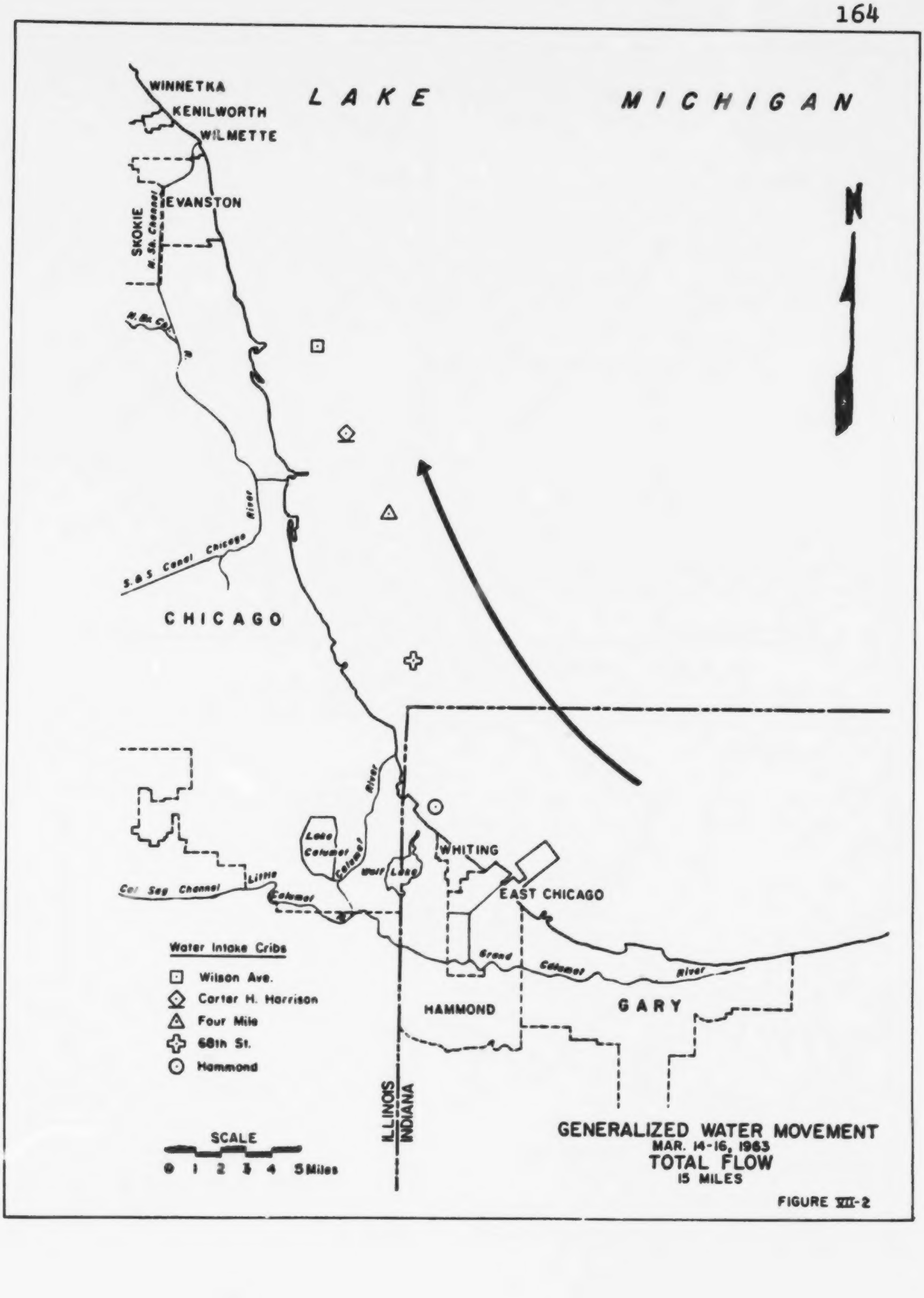
FIGURE VI-6

GPO 816-151-6


LAKE MICHIGAN
N
WINNETKA
KENILWORTH
WILMETTE
EVANSTON
SKOKIE
N. Sh. Channel
N. Br. Chi.
Chicago River
S. & S. Canal
CHICAGO
Lake Calumet
Calumet River
Wolf Lake
Little Calumet
Cal Sag Channel
WHITING
EAST CHICAGO
Grand Calumet River
HAMMOND
GARY
ILLINOIS
INDIANA
Water Intake Cribs
□ Wilson Ave.
◇ Carter H. Harrison
△ Four Mile
✚ 68th St.
⊙ Hammond
SCALE
0 1 2 3 4 5 Miles

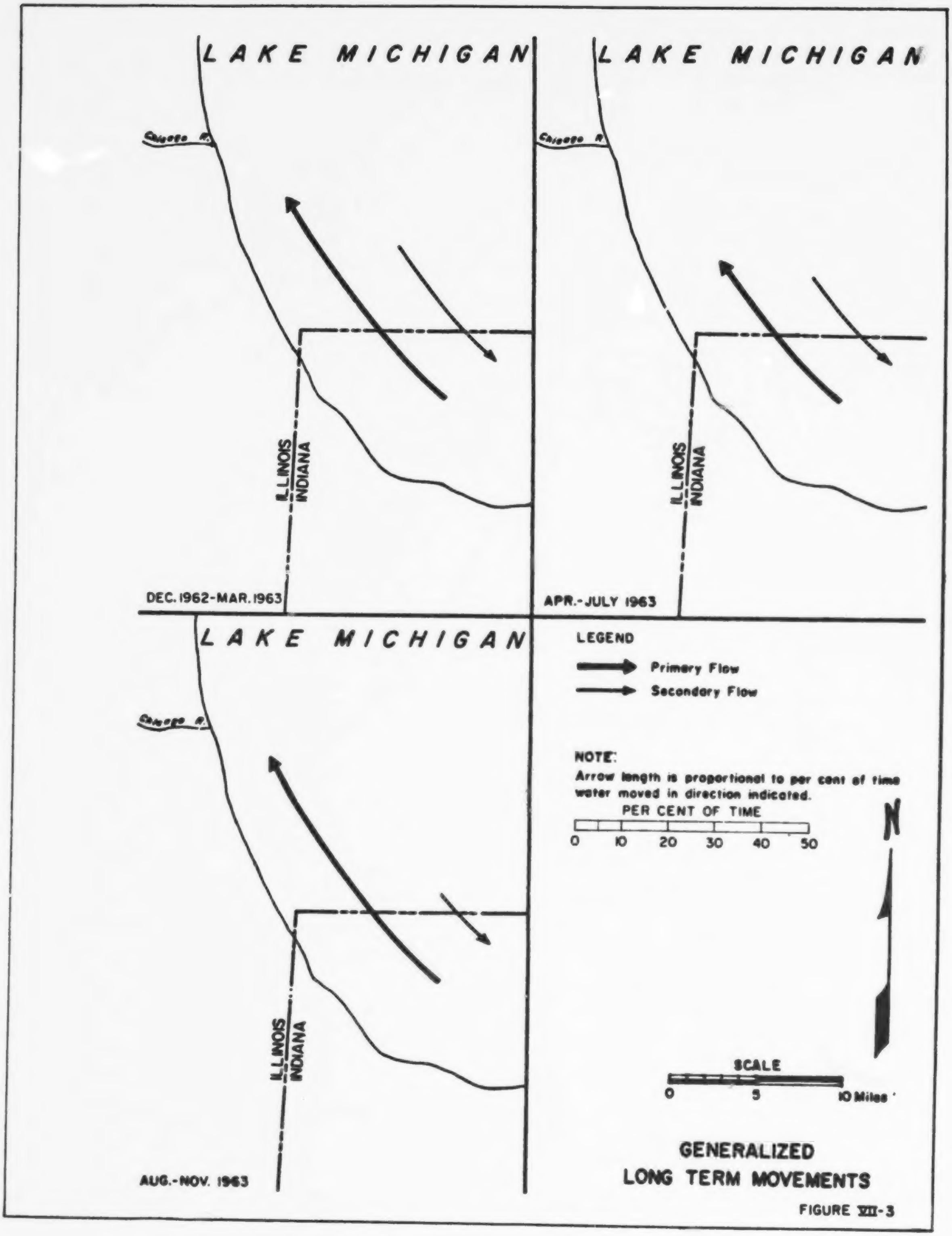
GENERALIZED WATER MOVEMENT
JAN. 21-24, 1963
TOTAL FLOW
19 MILES

FIGURE VIII-1


LAKE MICHIGAN
WINNETKA
KENILWORTH
WILMETTE
EVANSTON
SKOKIE
N. Sh. Channel
N. Br. Chi.
River
S. & S. Canal
Chicago
CHICAGO
N
Lake Calumet
Calumet
River
Wolf Lake
WHITING
EAST CHICAGO
Cal Sag Channel
Little
Calumet
Grand
Calumet
River
HAMMOND
GARY
ILLINOIS
INDIANA
Water Intake Cribs
⊡ Wilson Ave.
◇ Carter H. Harrison
△ Four Mile
✙ 68th St.
⊙ Hammond
SCALE
0 1 2 3 4 5 Miles

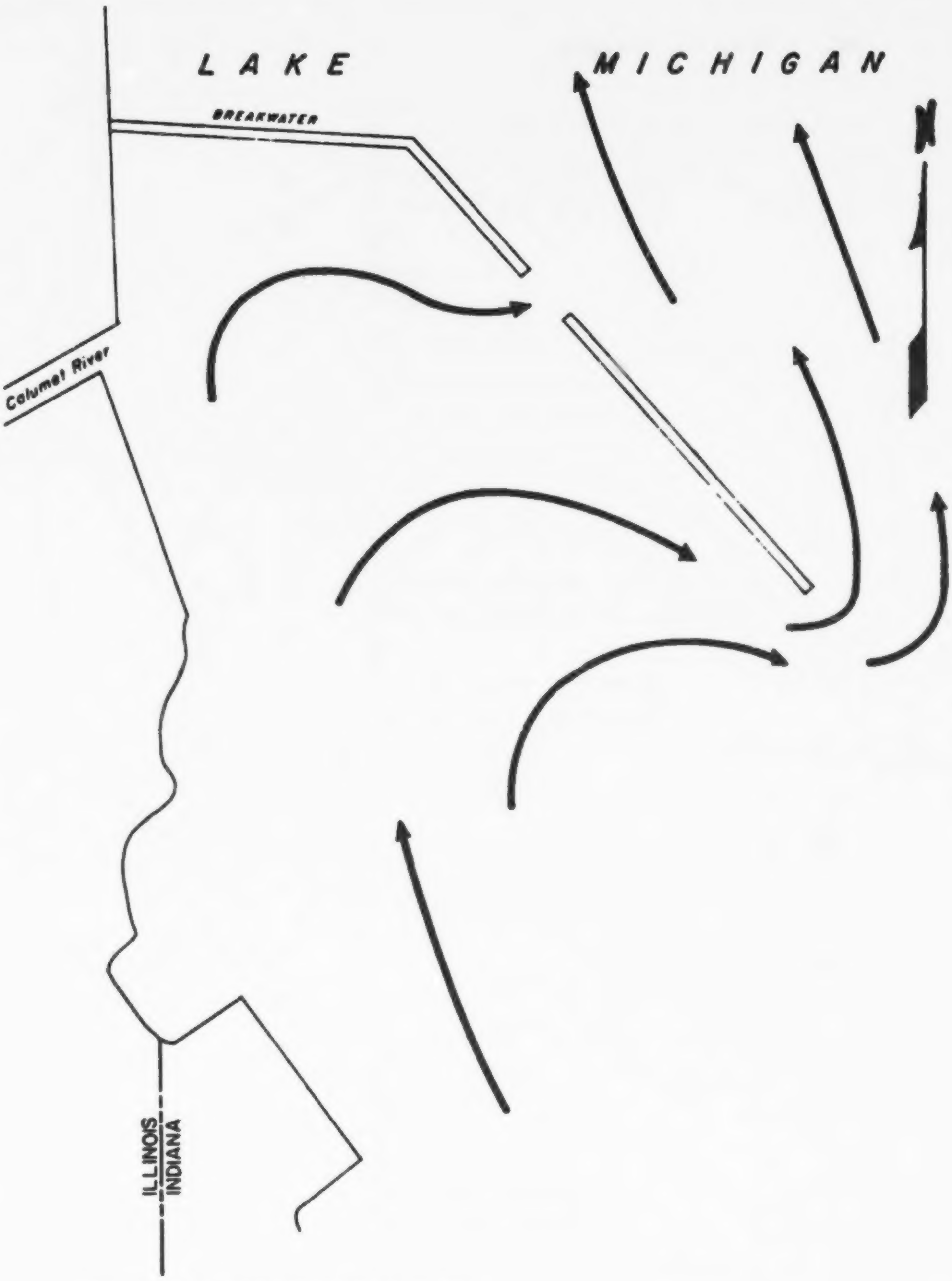
GENERALIZED WATER MOVEMENT
MAR. 14-16, 1963
TOTAL FLOW
15 MILES

FIGURE VII-2


LAKE MICHIGAN
Chicago R.
ILLINOIS
INDIANA
DEC. 1962-MAR. 1963
LAKE MICHIGAN
Chicago R.
ILLINOIS
INDIANA
APR.-JULY 1963
LAKE MICHIGAN
Chicago R.
ILLINOIS
INDIANA
AUG.-NOV. 1963
LEGEND
Primary Flow
Secondary Flow
NOTE:
Arrow length is proportional to per cent of time water moved in direction indicated.
PER CENT OF TIME
0
10
20
30
40
50
N
SCALE
0
5
10 Miles

GENERALIZED
LONG TERM MOVEMENTS

FIGURE VII-3

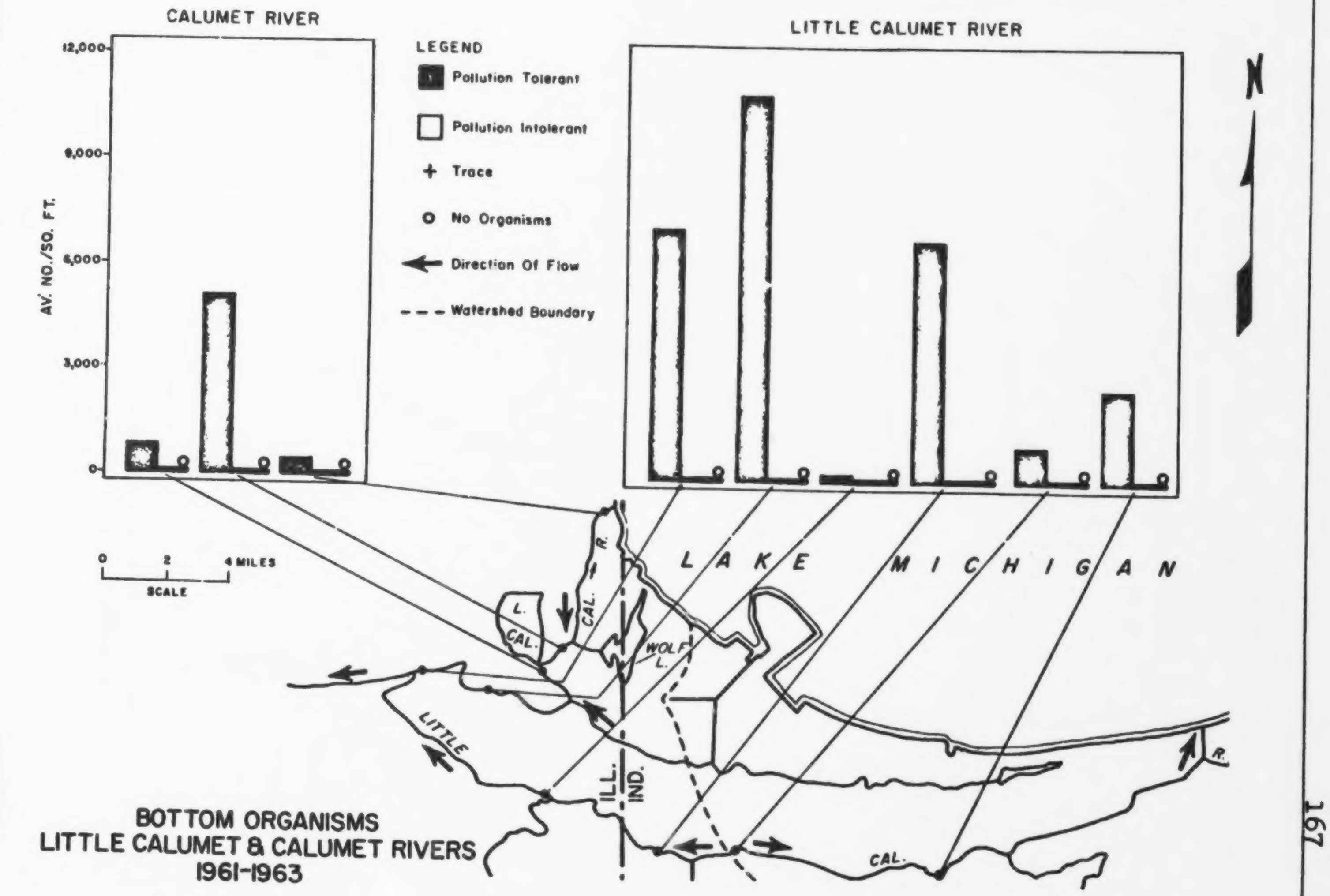

LAKE MICHIGAN
BREAKWATER
N
Calumet River
ILLINOIS
INDIANA

Current pattern in Calumet Harbor during prevailing conditions with light wind from southwest.

CALUMET HARBOR

SUMMER 1963

FIGURE VII-4



BOTTOM ORGANISMS
LITTLE CALUMET & CALUMET RIVERS
1961-1963

FIGURE VII-1

COLIFORM DENSITIES — GRAND CALUMET RIVER

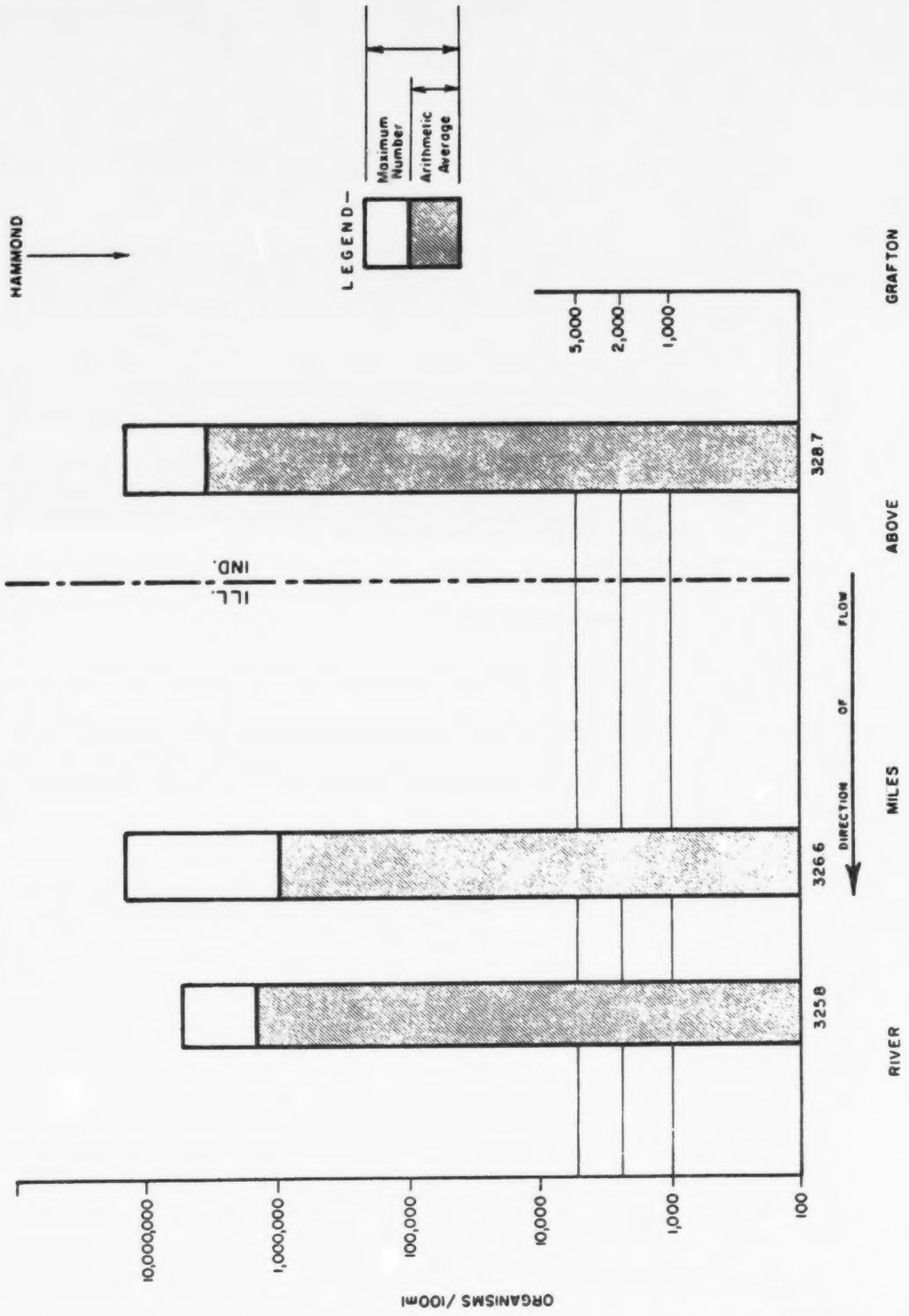
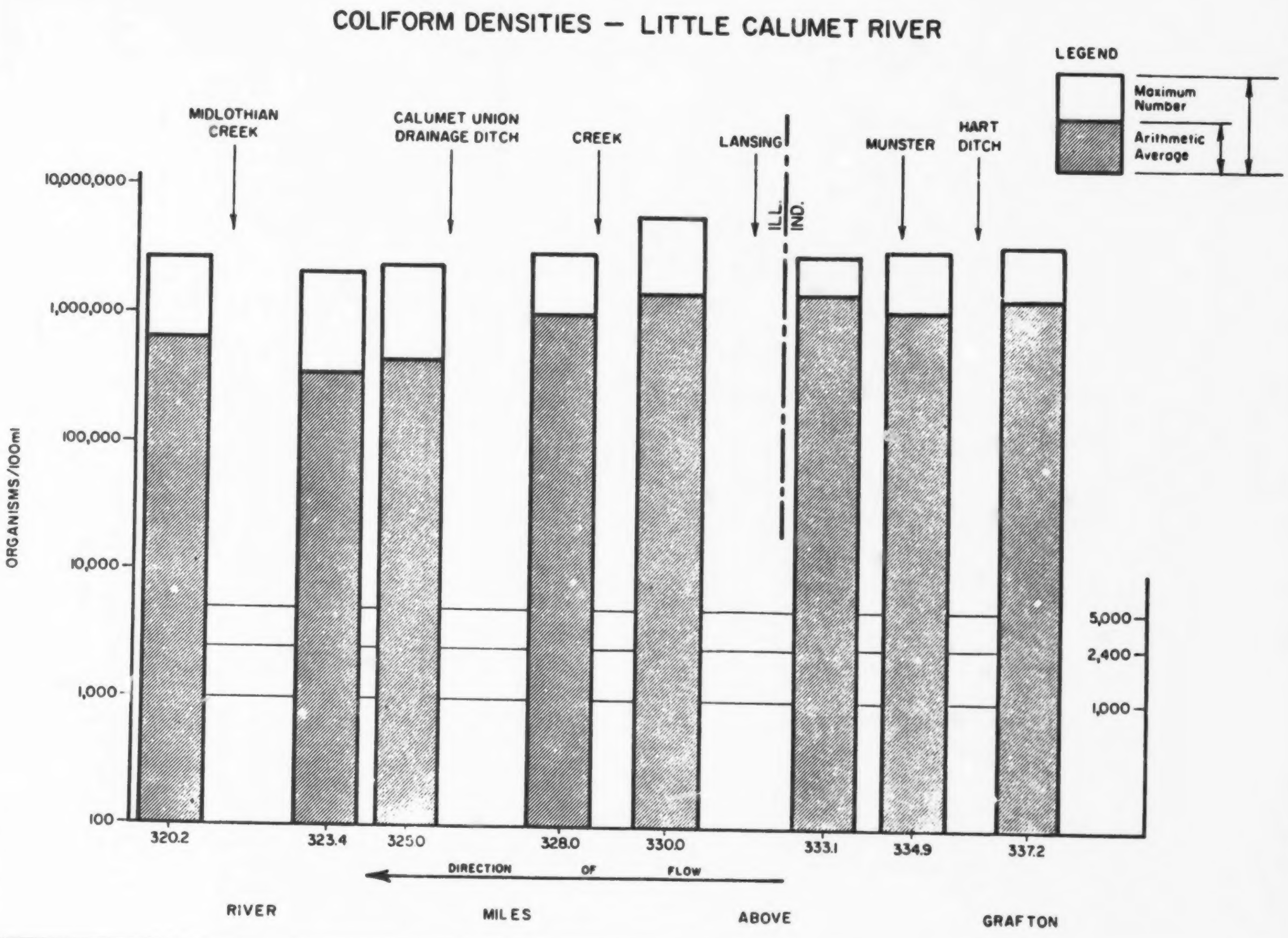


FIGURE VIII - 2



COLIFORM DENSITIES — LITTLE CALUMET RIVER

FIGURE VIII-3

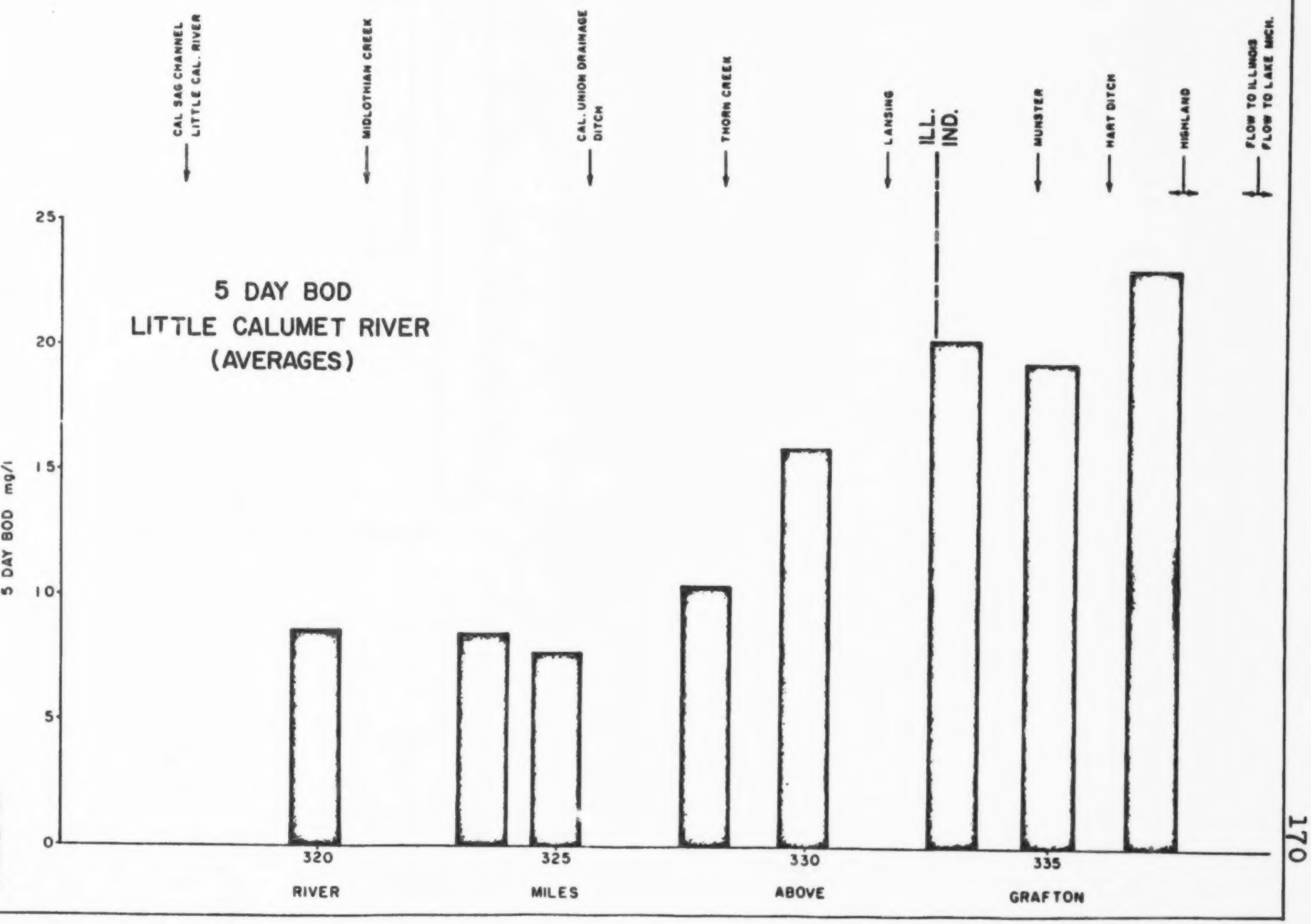


FIGURE VIII-4

GPO 816-151-4

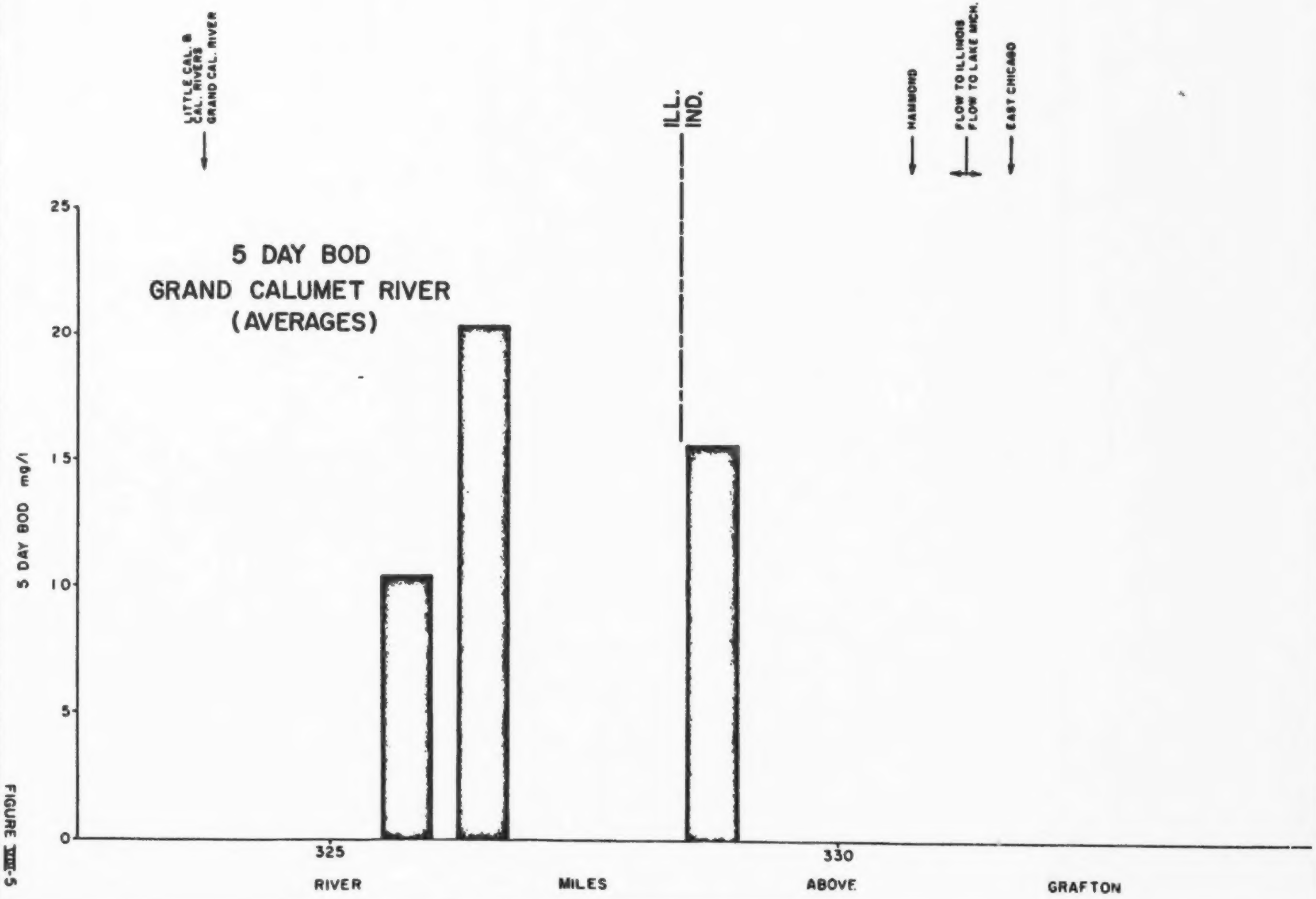
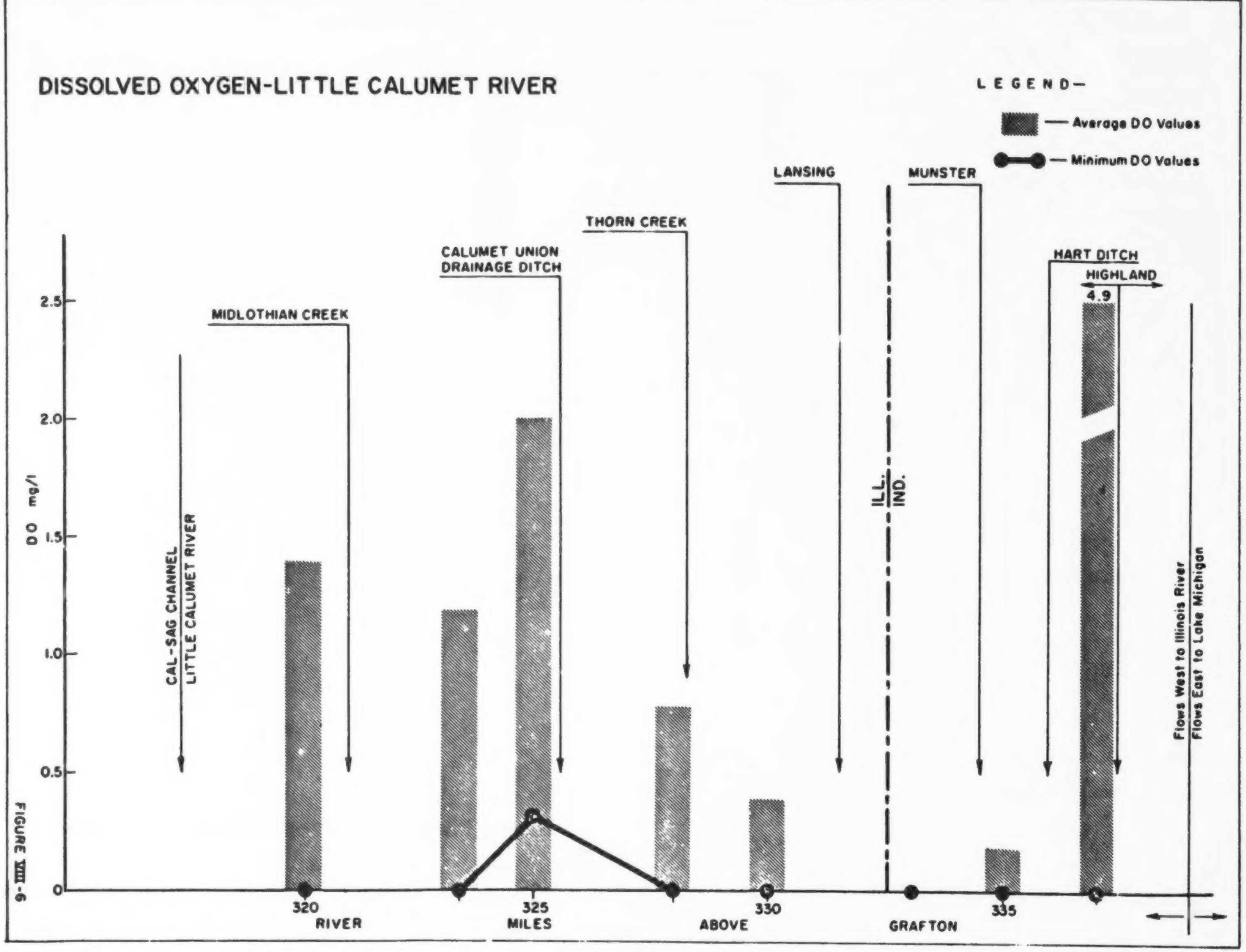
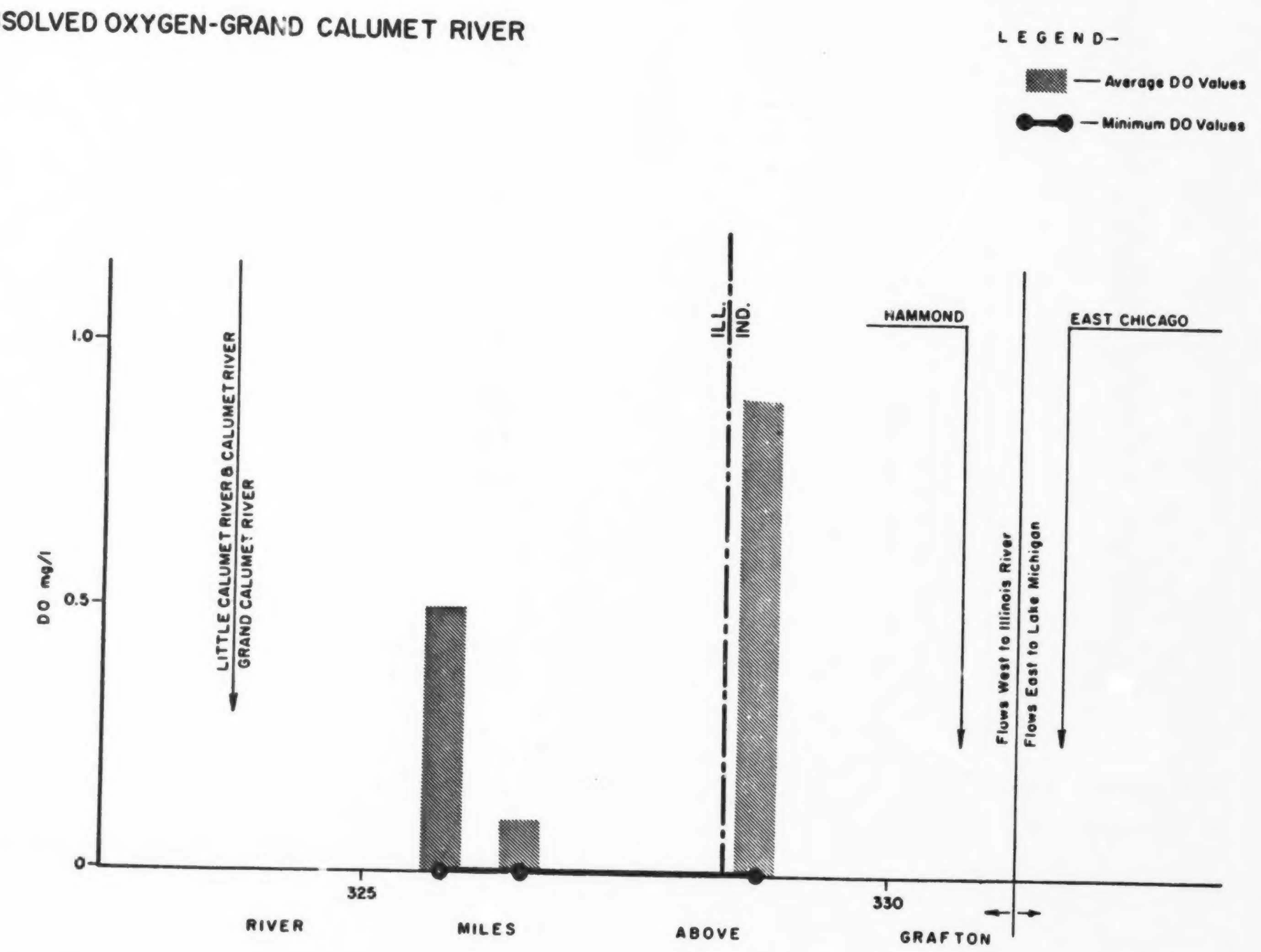


FIGURE VIII-5



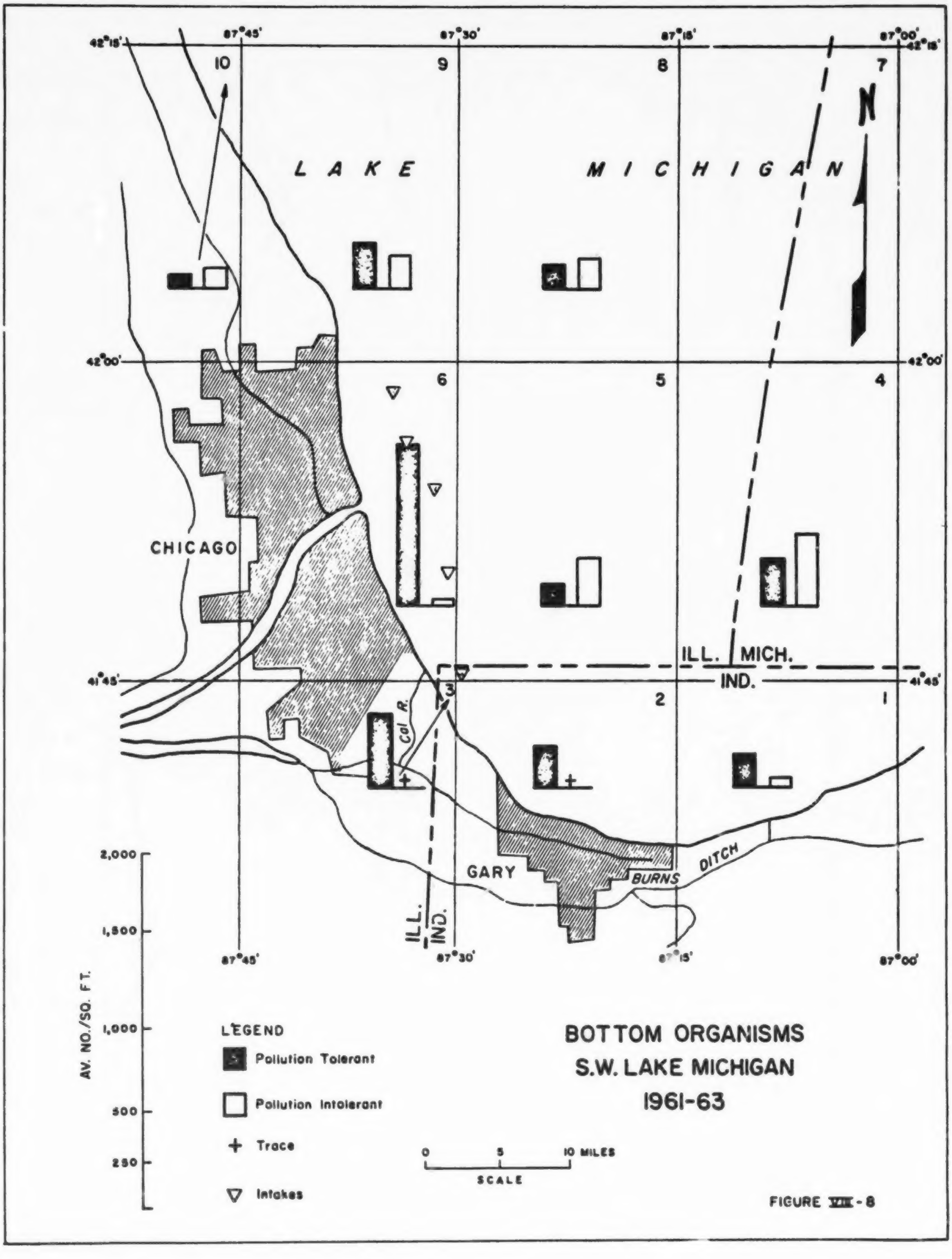
DISSOLVED OXYGEN-LITTLE CALUMET RIVER

FIGURE VIII-6



DISSOLVED OXYGEN-GRAND CALUMET RIVER

FIGURE VIII-7


42°15'
87°45'
87°30'
87°15'
87°00'
42°00'
41°45'
10
9
8
7
6
5
4
3
2
1
N
LAKE MICHIGAN
CHICAGO
ILL. MICH.
IND.
Cal R.
GARY
BURNS DITCH
ILL.
IND.
2,000
1,500
1,000
500
250
AV. NO./SQ. FT.
LEGEND
Pollution Tolerant
Pollution Intolerant
+ Trace
▽ Intakes
0
5
10 MILES
SCALE

BOTTOM ORGANISMS
S.W. LAKE MICHIGAN
1961-63

FIGURE VII-8

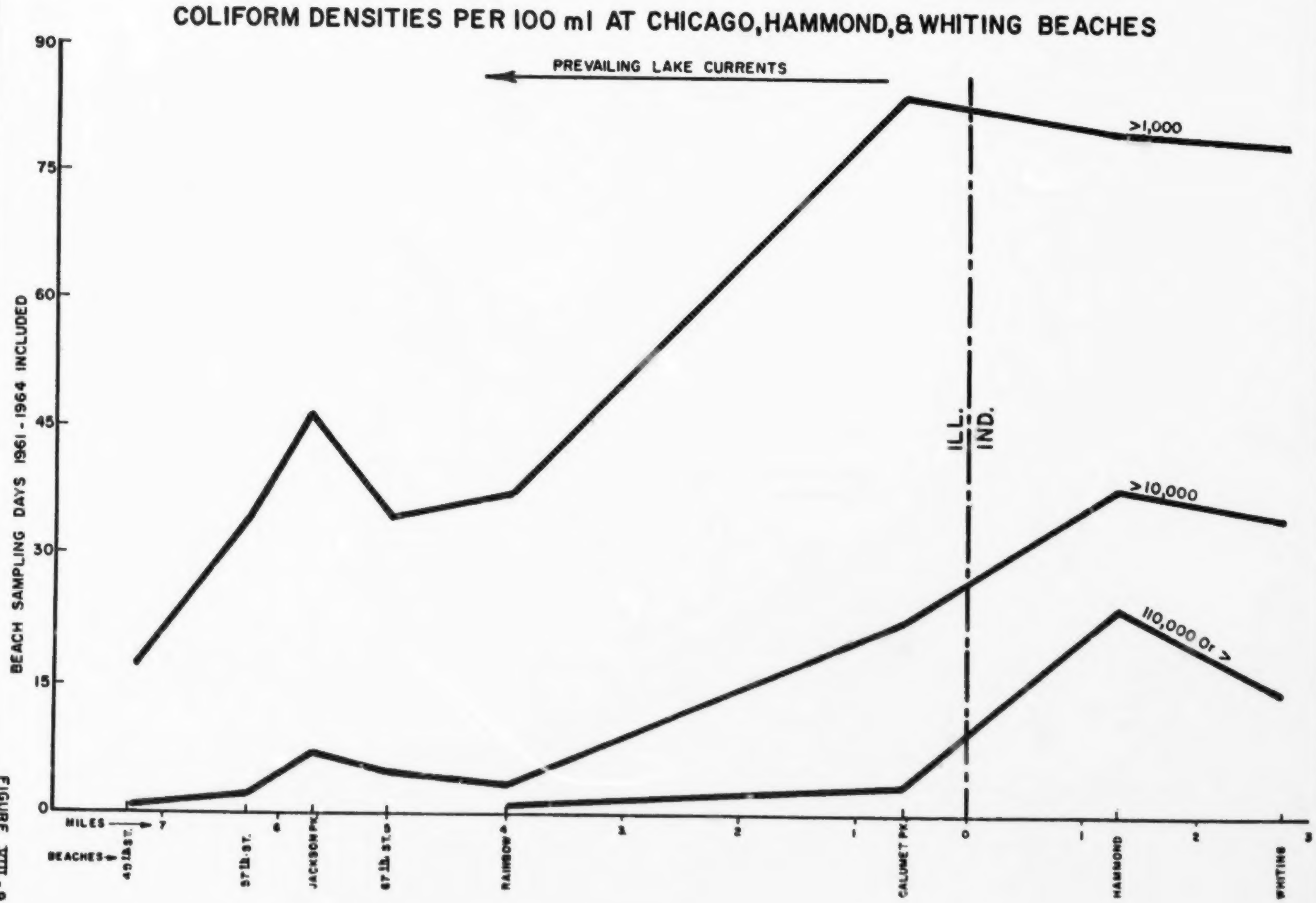
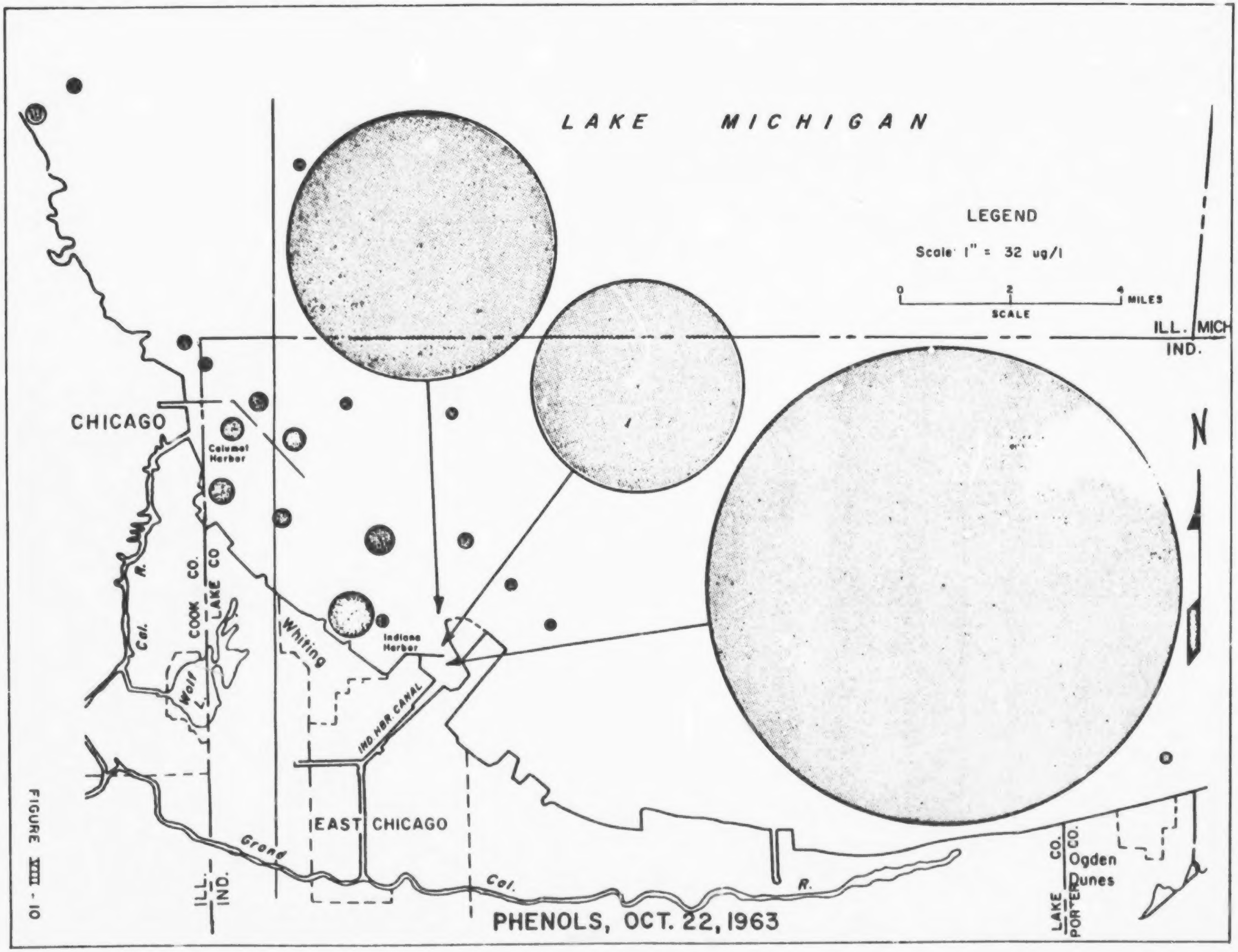
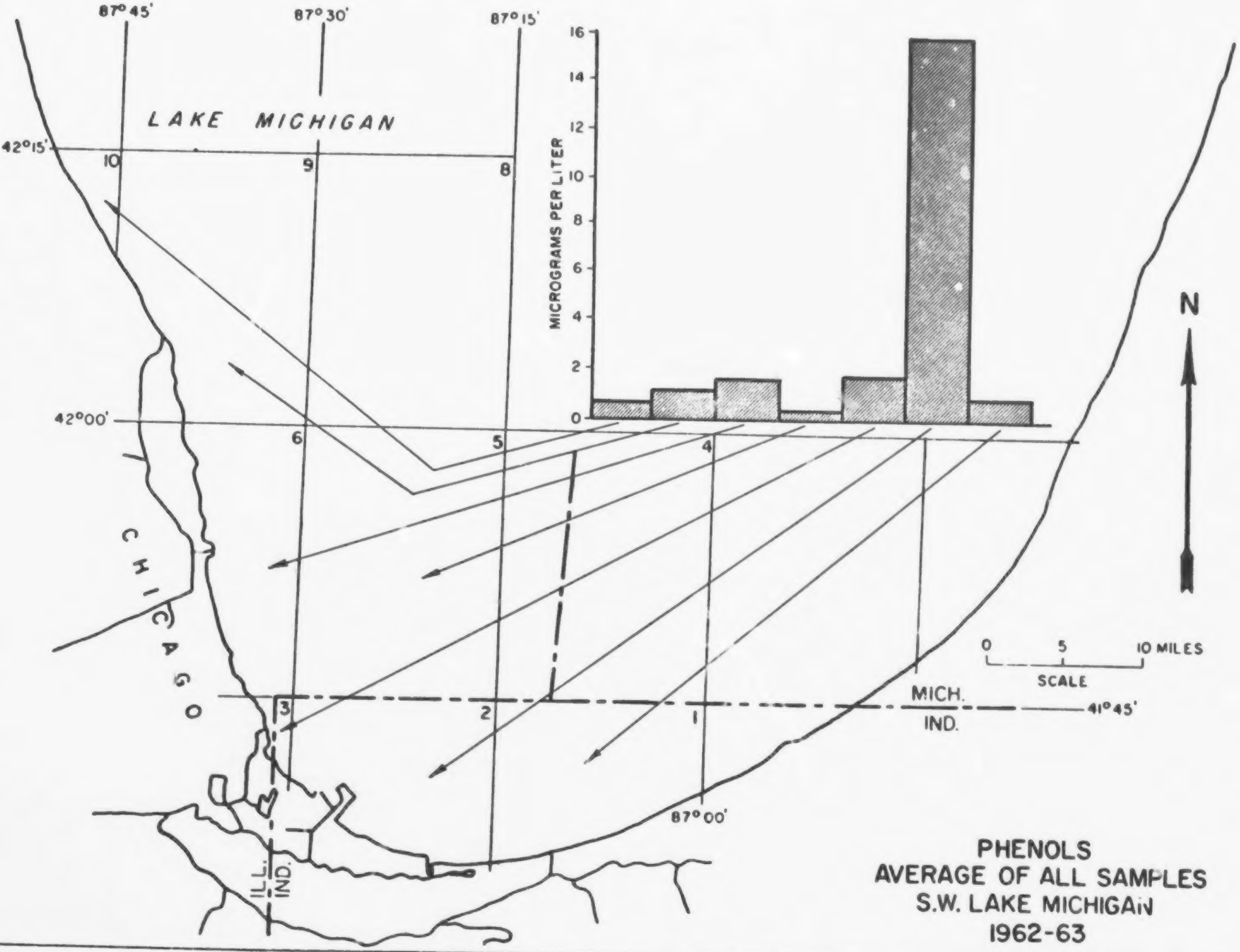

COLIFORM DENSITIES PER 100 ml AT CHICAGO, HAMMOND, & WHITING BEACHES

FIGURE VIII - 6


LAKE MICHIGAN
LEGEND
Scale 1" = 32 ug/l
0
2
4
MILES
SCALE
ILL.
MICH
IND.
N
CHICAGO
Calumet Harbor
Indiana Harbor
Whiting
COOK CO.
LAKE CO
Cal.
R.
Wolf L.
IND HBR CANAL
EAST CHICAGO
Grand
Cal.
R.
ILL.
IND.
LAKE CO.
PORTER CO.
Ogden Dunes

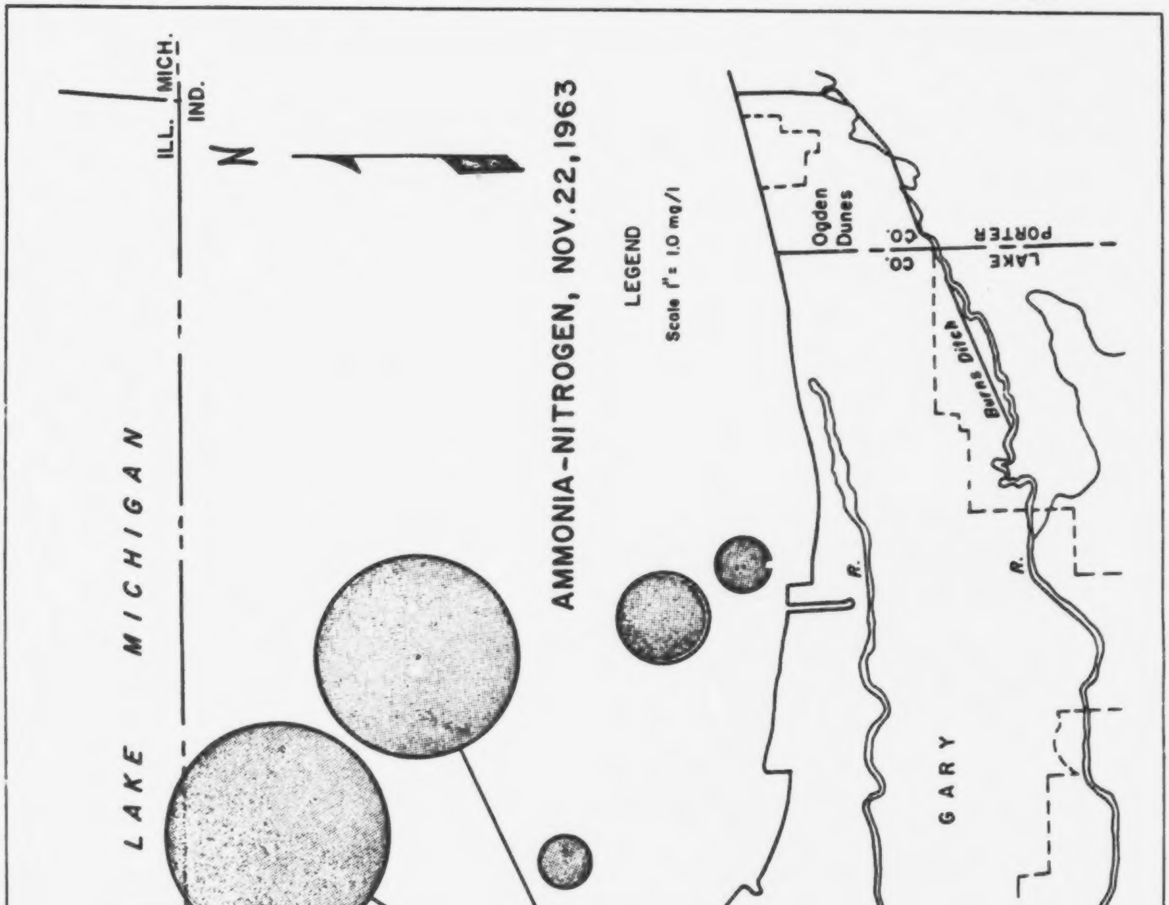
PHENOLS, OCT. 22, 1963

FIGURE VIII - 10


87°45'
87°30'
87°15'
LAKE MICHIGAN
42°15'
10
9
8
42°00'
6
5
4
3
2
1
MICROGRAMS PER LITER
0
2
4
6
8
10
12
14
16
N
0
5
10 MILES
SCALE
MICH.
IND.
41°45'
87°00'
CHICAGO
ILL.
IND.

PHENOLS
AVERAGE OF ALL SAMPLES
S.W. LAKE MICHIGAN
1962-63

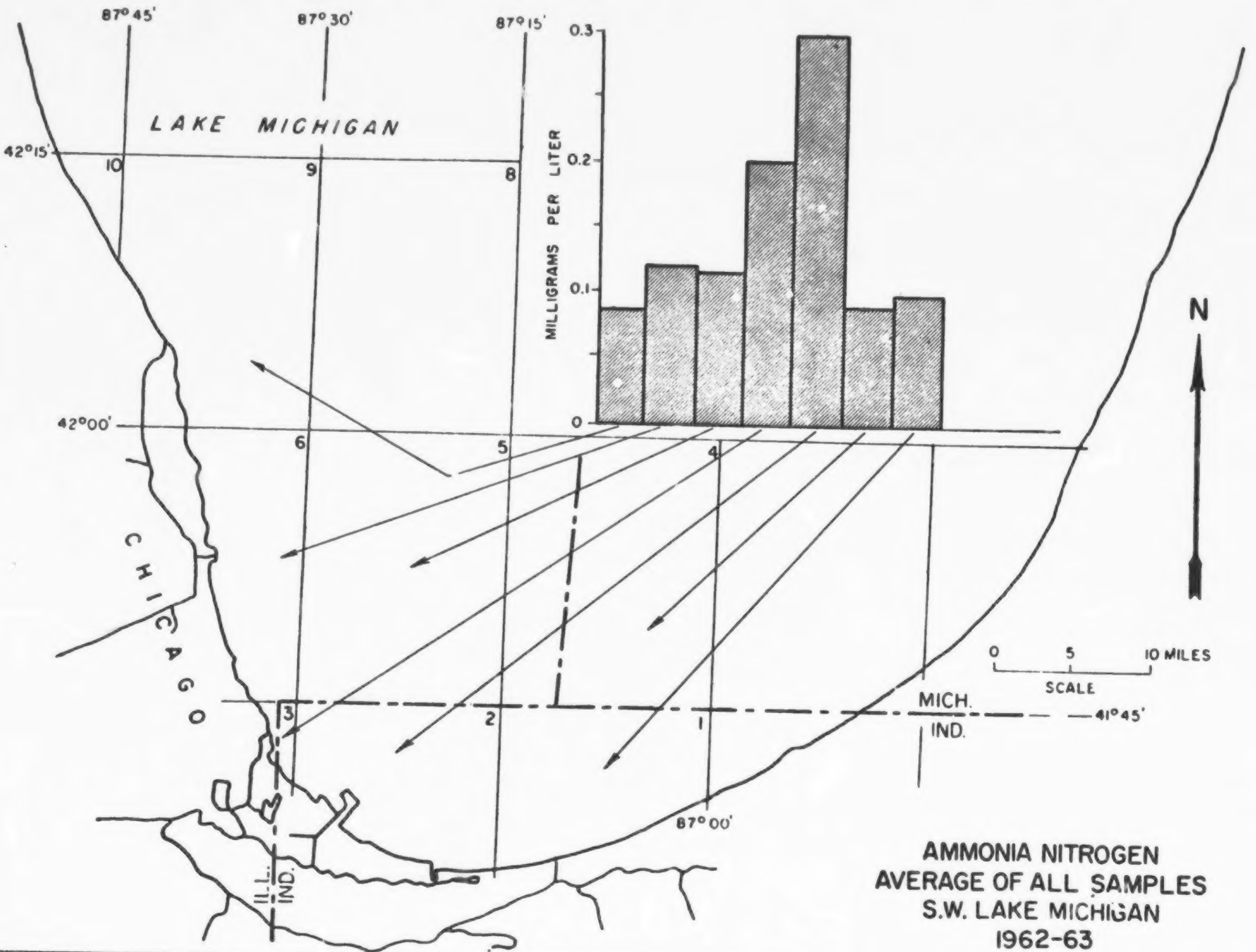
FIGURE VIII-11


AMMONIA-NITROGEN, NOV.22,1963

LAKE MICHIGAN
ILL.
MICH.
IND.
N
LEGEND
Scale 1" = 1.0 mg/l
Ogden Dunes
LAKE CO.
PORTER CO.
Burns Ditch
R.
GARY
Cal. R.
Indiana Harbor
IND. HBR. CANAL
EAST CHICAGO
HAMMOND
Whiting
Grand Cal. R.
Little Cal. R.
SCALE
MILES
0
4
ILL.
IND.
Calumet Harbor
LAKE CO
COOK CO.
Wolf L.
Cal. R.
CHICAGO

FIGURE VIII - 12

GPO 818-151-3


87° 45'
87° 30'
87° 15'
LAKE MICHIGAN
42° 15'
10
9
8
42° 00'
6
5
4
0.3
0.2
0.1
0
MILLIGRAMS PER LITER
N
0
5
10 MILES
SCALE
MICH.
IND.
41° 45'
3
2
1
87° 00'
CHICAGO
ILL.
IND.

AMMONIA NITROGEN
AVERAGE OF ALL SAMPLES
S.W. LAKE MICHIGAN
1962-63

FIGURE VIII - 13

GPO 816-151-2

MR. LE BOSQUET: Findings are based on data obtained from state, local and sanitary district records, industries, and from sampling by the Public Health Service.

Information presented in the report is but a small sampling of the total available on this complex situation.

Principal items in the bibliography include the record of the Supreme Court hearings which were terminated recently in July of '63; the Jones Committee record already mentioned is also a very excellent document, and we have a number of copies and I recommend it for your attention; the information collected in connection with the development of a comprehensive Water Pollution Control Program for the Illinois River and Lake Michigan Basins has been used; and finally, information on past conditions is found in Public Health Bulletin 170 of 1927 which reports on an early cooperative investigation in which I was happy to participate as a young fellow.

The cooperation --

CHAIRMAN STEIN: Mr. LeBosquet, if you will let me interrupt a moment, Mr. Klassen just showed me something he pulled from his record and it says, "Report on Analytical Study of Relationship Between Sewer Outlets and Bathing Beaches in Lake Michigan Along North

Shore Sanitary District by Maurice LeBosquet, Assistant Sanitary Engineer and Harry F. Ferguson, Chief Sanitary Engineer," and the date on this, Maurice, is August-September 1922.

(Laughter.)

I think your qualifications speak for themselves.

(Laughter.)

MR. LE BOSQUET: I don't know whether I am decrepit or not.

(Laughter.)

The cooperation provided by the Indiana Stream Pollution Control Board, the Illinois Sanitary Water Board, the Metropolitan Sanitary District of Greater Chicago, the industries and others in supplying valuable information is greatly acknowledged.

This industrial waste information was obtained from these sources plus studies by the Public Health Service.

Specifically, the Public Health Service conducted a sampling survey of industrial wastes in the Calumet area in the latter half of 1963.

The dissolved oxygen, BOD, and bacterial findings for the Calumet area derive from an intensive 24-day sampling survey conducted between August 20th and

September 12, 1963. Samples were collected once a day at each sampling station on some 20 days of the period.

This report is the work of many people. I see them sitting before me. A number of these people are in attendance and available to supplement their respective sections of the report.

The report considers the quality characteristics of the waters as they exist today, evaluates the effects of waste discharges on the water quality and water uses, and summarizes the principal problems.

Outline of presentation: The report deals with the entire area of 742 square miles in one discussion. For purposes of clarity, I propose to follow a description of the complex stream system with a discussion of the various sub-areas one at a time and finish with a general summary.

The area selected in the order of presentation are as follows:

Burns Ditch Drainage Area; Little Calumet River, Hammond to Blue Island; Grand Calumet River and Indiana Harbor; Calumet Channel, Lake Michigan to Blue Island; and finally, Lake Michigan.

We have here five separate rather complex situations and even to discuss them lightly I am afraid will take a little time. I will be as brief as possible.

After each area of discussion, the situations discussed will be further described with air photographs. Special thanks are extended to Colonel James P. Strauss of the United States Army who provided helicopter reconnaissance and photographic flights.

The stream system: The Calumet area is a flat plain with much of the land only slightly above Lake Michigan water levels.

In what might be considered their natural state, the Little Calumet and Grand Calumet Rivers originated in Indiana and flowed westward into Illinois where they joined and became simply the Calumet River which discharged into Lake Michigan.

However, the development of the area by man has changed this flow pattern.

In 1922, the Calumet Sag Channel was completed between the Chicago Sanitary and Ship Canal and the Little Calumet River at Blue Island, Illinois. This construction caused the Calumet River and that portion of the Little Calumet River from Blue Island to the Calumet River to be reversed and thus flow away from Lake Michigan.

However, this is an unstable situation; depending on storm runoff and fluctuating lake levels, the stream frequently flows toward Lake Michigan.

When you started, Murray, I might explain that I swam in that channel before they turned the sewage in it. It was a ten-mile swimming pool, very beautiful and quite pure at that time.

CHAIRMAN STEIN: You wouldn't swim in it now, would you?

MR. LE BOSQUET: The Indiana Harbor Canal was completed in East Chicago, Indiana, in 1903. Construction of this canal connected the Grand Calumet River to Lake Michigan.

Thus, the Grand Calumet River east of this point is now tributary to Lake Michigan through the Indiana Harbor Canal.

The Grand Calumet River from this point west to the area near the East Chicago-Hammond, Indiana, city limit has been reversed and now flows to Lake Michigan via the Indiana Harbor Canal.

The point where the division of flow occurs is rather indefinite, and depending upon the local level of Lake Michigan, dredging operations, rain fall intensity and the actual divide can vary over a distance of several miles.

Under normal dry-weather conditions, the East Chicago sewage treatment plant effluent flows eastward to the Indiana Harbor Canal and Lake Michigan, while a variable part of the Hammond Sewage Plant effluent flows westward to the Calumet River.

A temporary dam on the Grand Calumet River at Columbia Avenue in Hammond, Indiana, has recently been proposed by the U.S. Corps of Engineers. The purpose of this dam would be to prevent water reaching the Illinois River System from the Grand Calumet River east of that point, when the locks at Blue Island, Illinois, have been removed.

The exact location of the new dam is still subject to study.

Wolf Lake is located astride the Illinois-Indiana State Line in Chicago and Hammond. The original connecting channel from Wolf Lake to Lake Michigan has been blocked, and a connection to the Calumet River in Chicago has been constructed.

The City of Hammond has a much-used park on the east shore of Wolf Lake which occupies most of the Indiana shore line. The Illinois portion is a part of the Wolf Lake Conservation Area.

So much for the general description. Now, we go to the specific Burns Ditch drainage area.

Burns Ditch was completed in 1923 to connect the eastern part of the Little Calumet River in

Indiana to Lake Michigan near Ogden Dunes. This was strictly a drainage project.

This construction caused an indefinite division of the flow in the vicinity of Highland, Indiana, reversing the flow of the Little Calumet River from this point east to Ogden Dunes.

The Burns Ditch drainage area is therefore the drainage area of the Little Calumet River east of the new divide.

Burns Ditch is a very popular recreational area. There are a number of marinas and launching areas and some fishing. The Corps of Engineers has made a study of a proposal for the possible development of Burns Ditch as a commercial harbor.

Municipal wastes: A total of 19 municipal waste sources drain to Lake Michigan by way of Burns Ditch. These sources are all relatively small, but the population served totals about 93,000 and the population equivalent as discharged is about 19,000.

At present, many of these sources discharge inadequately treated sewage. Some are in the process of being corrected. For instance, the Merrillville Conservancy District has been organized to serve the Black Oak-Ross area south of Gary, Indiana.

Indiana towns served by combined sewers

which overflow at times of storm to the Burns Ditch drainage area are Chesterton, Porter, Valparaiso, East Gary, Hobart and Griffith.

Industrial wastes: The Midwest Steel Division, National Steel Corporation, provides a high degree of treatment for its sheet and tin mill wastes. This is located at the mouth of Burns Ditch. There is no significant pollution to Burns Ditch from this source, and this plant illustrates the degree of waste control that can be achieved in a steel rolling mill.

The Bethlehem Steel Company is installing similar waste treatment facilities for its Burns Harbor Sheet & Tin Mill now under construction. When and if the proposed Burns Harbor deep water port is constructed, these two companies plan to install basic steel and coking facilities. Their plans to control waste from these future facilities have not been reported.

The State of Indiana has notified the companies that adequate waste treatment must be provided and plans must be approved before basic steel mills are constructed.

Water quality: Nutrients in treated sewage from towns in the drainage basin tributary to Burns Ditch, and the sluggishness of the stream, combine to effect the most favorable condition for planktonic algal growth.

The subsequent die off of the algae forms a bottom sediment favorable for populations of pollution tolerant sludgeworms and bloodworms. The stream is biologically degraded, but perhaps not as severely as other area streams.

The water in Burns Ditch shows an average coliform density of 120,000 per hundred ml near its point of discharge to Lake Michigan; and 1.7 million per hundred ml about four miles inland.

Fecal strep at the latter point averaged 83,000 per one hundred ml.

There is no evidence of interstate pollution from the discharge of wastes to Lake Michigan by way of Burns Ditch. Burns Ditch has some effect on the contribution of nutrients in the south end of Lake Michigan, and contributes local bacterial pollution. The effects of increased development in this area bear careful watching.

Before we go to the next area, I'd like to show you a few pictures that we have of this particular area.

Will you please turn off that light?

This is a panorama showing the Bethlehem Steel Plant under construction in the sand dunes, Chesterton, Indiana. The Little Calumet River is at the left; Northern Indiana Public Service Company, Baileytown Station is at the right on the shore of Lake Michigan. Midwest Steel Company is fairly visible in the middle distance.

This is the type of industrial development that may be anticipated in that area.

Can we go to the next slide?

This is another view of the Bethlehem Steel Corporation and the Northern Indiana Public Service Company, Chesterton, Indiana.

MR. POSTON: How big is this area, Maurice?

MR. LE BOSQUET: You mean the whole drainage area?

MR. POSTON: Well, this plant area. I think it is important to understand the extensive plant that is being built and how big it is.

MR. LE BOSQUET: The total, probably, of Bethlehem Steel -- I haven't the faintest --

A VOICE: 330 acres.

MR. LE BOSQUET: 330 acres; thank you.

Next slide, please?

This is the Bethlehem Steel Company waste outfall ditch to the Little Calumet River on the left.

Next slide, please?

This shows boating activities on Burns

Ditch south of Highway U.S. 12, Portage, Indiana. You will note quite a number of boat docks and marinas on the left. This is a very popular area. There is some fishing.

Next slide, please?

This is an air view of the Midwest Steel Division at the mouth of Burns Ditch. A part of the industrial waste treatment facilities are visible on the east side of Burns Ditch. Domestic sewage is piped overhead to the activated sludge sewage treatment plant on the west side and that is Lake Michigan in the background.

Next slide, please?

This is a panorama view of the Midwest Steel Division at Burns Ditch on Lake Michigan looking west. That completes the slides on Burns Ditch and we will go on.

Do you want to ask questions in between?

CHAIRMAN STEIN: Yes. Are there any questions now?

MR. POOLE: I just want to remind Mr. LeBosquet that the activated sludge plant effluent he referred to at the last was also chlorinated.

MR. LE BOSQUET: Thank you for supplementing the record.

CHAIRMAN STEIN: As the audience can see, the plot is beginning to thicken.

(Laughter.)

But on the basis of past experience, I know what we have to do now and that is to recess for ten minutes because we know the attention span of some of our older people gets a little strained at this point.

We will reconvene in ten minutes.

(Whereupon, a recess was had)

CHAIRMAN STEIN: May we reconvene?

I'd like to at this time -- and I hope you indulge me, because being a Washington bureaucrat, I may have committed an unpardonable sin.

We have one other Congressional representative. I'd like to call on Mr. A. J. Wakefield, a representative of Congressman Mosher. Mr. Wakefield?

MR. WAKEFIELD: Greetings, ladies and gentlemen from Congressman Mosher, 13th District of Ohio. He has a message I think of importance to this group because pollution has many facets, but many of them are local, and because of the nature of this group, I think we should take a picture of the five Great Lakes, and there are some things which he knows about and haven't been said yet, I think.

There are three facets of pollution, of course. One is chemical poison. Well, that can't exist on the Great Lakes systems because of the tremendous million to one dilution in five different steps. That is a problem that may be at Calumet and every little harbor and stream that flows into the lakes.

But, for instance, poison can be put in at St. Louis in the Mississippi River and it can be measured at New Orleans. Why?

Because the poison goes down the Mississippi River just like a train of cars, but it can't do that in the great lakes because of that tremendous dilution.

Another pollutant, of course, is temperature. We have Lake Superior in the summer at a temperature of 39; Lake Erie, a temperature of 75. They flow and interconnect, one to another and that is a big factor and that to a degree is cancelled out.

But we have this organic pollution and I think what this movement needs more than anything else is something to happen and that is the message from Congressman Mosher.

Why can't we do something about it, start to do something?

Sure, we have these municipal problems all along the lakes and they will be with us forever.

My father was mayor of a little town on Lake Erie and put in the second sewage disposal plant.

The first one was Lakeland, Ohio; the second was Vermillion, Ohio, 40 years ago.

I bring greetings from Professor Langlois who is retired now. He sent me a postcard from Honolulu. He is out where there is a lot of great water -- complete dilution. But I wish this meeting could carry on the enthusiasm that we all hold for the project with its many diversifications, by doing something also, and that Congressman Mosher could by consulting some of these people, especially Langlois -- who tells about the lakes in Europe where men have lived on them for 2,000 years (and they are quite acceptable, I might say); but they put a float on them with a pump on, windmill, and an air pump. So his message and mine to you is let's take care of this organic thing by introducing a little bit of aeration.

The first thing that happens to human organic waste is putrefaction. It takes oxygen out of the water and people very carelessly throw their beer cans and the beer cans rust.

It takes oxygen out of the water. Everything does, and the fish killed in Lake Erie comes through lack of oxygen.

CHAIRMAN STEIN: Thank you, Mr. Wakefield, for a very interesting statement.

Mr. LeBosquet?

Mr. LE BOSQUET: The next section I am dealing with is the Little Calumet River, from Hammond to Blue Island. This non-navigable stretch of the Little Calumet River between Hammond and Blue Island flows west and discharges to the Calumet-Sag Channel. Two principal tributaries are Hart Ditch and Thorn Creek, both of which enter from the south.

Municipal waste: The estimated population served by sewers in this area is 193,000. The waste load, including industrial waste, totals 283,000 population equivalent to treatment works which reduce the discharged load to 53,000.

The Sanitary District of Bloom Township, Illinois, serves Park Forest, Chicago Heights, and South Chicago Heights, and a large industrial district in Chicago Heights.

The Sanitary District has engaged two firms of consulting engineers to study its problems. Both reports have been received and action to implement the recommendations have been taken.

A number of Illinois communities having combined sewers which overflow to the Calumet River system during times of storm are Calumet City, Burnham, South Holland, Phoenix, Lansing, Riverdale, Dolton and Posen.

Industrial wastes: Victor Chemical Company in Chicago Heights, Illinois, discharges an estimated 3,000 pounds per day of phosphate via the State Street Ditch and the Sanitary District of Bloom Township.

This phosphate can potentially produce algae nuisances downstream in the Illinois River.

Water quality: Study of the biology of the Little Calumet River shows only pollution tolerant bottom organisms. Coliform concentrations are on the order of one million per one hundred ml and 5-day BODs are as high as 20 milligrams per liter.

The Calumet River flows from Indiana to Illinois, and sewage discharged to the river in Indiana causes pollution of the river in Illinois.

I have no pictures of the Little Calumet.

The Grand Calumet River and Indiana Harbor: The Indiana Harbor Canal, completed in 1903, drains that portion of the Grand Calumet River east of the indefinite divide in Hammond, and discharges to Lake Michigan. The main channels are used primarily for navigation and for the disposal of wastes after control or treatment to various degrees. The channels also supply a small amount of industrial water with low quality requirements.

The principal industrial water supply in this area totaling 1,220,000 gallons per day, or about 2,000 second feet is pumped from Lake Michigan -- this area, the area outside the breakwater -- discharged to the Grand Calumet River and the Indiana Harbor Canal.

This used water supply or waste is substantial in quantity and constitutes the major flow discharged and carrying pollution from the Indiana Harbor Canal to Lake Michigan.

Municipal Wastes: The largest sources of municipal wastes discharged to Lake Michigan by way of the Grand Calumet River and Indiana Harbor Canal are the sewage treatment plants at Gary and East Chicago, Indiana. Neither plant accepts significant industrial wastes. Both provide secondary treatment.

At the present time, Gary has sewers and sewage treatment plant expansions under construction. This construction includes chlorination facilities and is nearing completion. It is understood that the East Chicago plant has chlorination facilities, but they are not regularly operated.

MR. POOLE: They are regularly operated now.

(Laughter.)

MR. LE BOSQUET: I have to give Mr. Poole a chance here.

The Hammond Sanitary District has a major sewer and sewage treatment plant expansion project now under construction which is nearing completion. All of the wastes from Griffith, Indiana,have been connected; part of Munster is connected, and works are under construction to connect all of it.

About half of Highland is connected, with the remainder scheduled to be. These connections should eliminate pollution of the Little Calumet River from these sources -- they should -- except for storm water overflows, and will result in an increased discharge of treated sewage to the Grand Calumet River.

The State of Indiana has recommended that the Hammond Sanitary District include chlorination facilities as part of the present construction project.

Several communities having combined sewers which overflow to the Indiana Harbor Canal-Grand Calumet River system during times of storms are Gary, East Chicago, Hammond and Whiting.

Industrial wastes: The largest sources of industrial waste on the Grand Calumet River and Indiana Harbor Canal are the United States Steel Corporation, Gary, Indiana; the Youngstown Sheet & Tube Company, Chicago; and the Inland Steel Company, East Chicago.

Three petroleum refineries are lesser but still major sources of waste. They are Cities Service Oil Company, Sinclair Refining Company and Mobil Oil Company, all in East Chicago.

A summary of the waste loads as discharged from these plants is as follows:

It takes a little time. It is on page 20 of the blue book, but I think we should examine these figures.

U.S. Steel, Gary, Indiana, 330 million gallons per day; the population equivalent is 266,000; Ammonia nitrogen discharge is 13,750; phenol discharge is 1,500; cyanides, 1700; and oil, 54,000. These are all in pounds per day.

I might insert here that these are based on one 24-hour period of composite sampling. A great degree of accuracy is not claimed.

Youngstown Sheet & Tube Company of Chicago is 250 million gallons per day, a population equivalent of 100,000; ammonia nitrogen, 4,000 pounds per day; phenol, 250 pounds per day; cyanide, 250 pounds per day; oil, 18,900 pounds per day.

Inland Steel Company, East Chicago, 480 million gallons per day; population equivalent, 200,000; ammonia nitrogen discharged, 16,800; phenols, 620 pounds per day; cyanide, 940 pounds per day; oil, 24,800.

The oil refineries, Cities Service, 80 million gallons per day,47,400 population equivalent; ammonia nitrogen, 1,140 pounds per day; phenol, 130; and oil, 4000 pounds per day.

Sinclair, East Chicago, 4 million gallons a day, population equivalent, 4,740; ammonia nitrogen, 130; phenol, 190; and oil, 290.

Mobil Oil Company, East Chicago, 4 million gallons a day, population equivalent, 12,400; ammonia nitrogen, 1,130 pounds per day; phenol, 780 pounds per day.

I think I will insert in here the fact that we have no mention of the settleable solids. The Corps of Engineers has been doing work in this field for many years, in this area, and I hope that we will have a comment from them to contribute.

All of these plants have invested in waste treatment facilities. The United States Steel Corporation quenches coke with ammonia still wastes and discharges waste pickle liquor to an absorption lagoon.

U.S. Steel uses public waters for a treatment works when it discharges residual blast furnace flue dust to the Grand Calumet River and recovers it with a dredge that is located in the river permanently.

The Youngstown Sheet & Tube Company recovers phenol and blast furnace flue dust with settling tanks or thickeners.

Inland Steel Company recovers phenol and blast furnace flue dust, but discharges waste pickle liquor to the Indiana Harbor Canal.

Analysis of the wastes from these three steel plants indicates that large amounts of coking wastes, blast furnace waste, and rolling mill wastes are reaching the Grand Calumet River and Indiana Harbor Canal.

The chief identifiable constituents in these discharges are oxygen-demanding wastes, oily wastes, phenolic materials, cyanide and ammonia.

Cities Service Oil Company provides oil separaters and sulfide and ammonia strippers, and has installed a secondary treatment pilot plant.

Sinclair Refining Company provides oil separaters, an ammonia and sulfide stripper, a sulfide oxidation tower, and removes phenol by extraction with crude oil and oxidation in a cooling tower.

Furthermore, water reuse is practiced by many of these plants thus reducing the volume of wastes discharged.

Sinclair also skims oil from the Lake

George branch, Indiana Harbor Canal, to help decrease the oil nuisance. It is not necessarily their oil.

Mobil Oil Company provides oil separators, cooling towers and straw filters. A sulfide and ammonia stripper is under construction. A sulfide oxidation tower is being installed. Mobil Oil Company uses the Indiana Harbor Canal as an industrial water supply and I am sure it has low quality requirements.

The DuPont Company in East Chicago, Indiana, produces hydrochloric acid as a by-product of one of its manufacturing operations. It is reported that the Indiana Stream Pollution Control Board has approved discharge to the Grand Calumet River through an underwater waste diffusion system of a maximum of 90,000 pounds per day of chloride, and at a normal river flow, a maximum of 125,000 pounds per day of unneutralized hydrochloric acid that would use up to 25 milligrams per liter of natural alkalinity in the river.

The approval was granted with the understanding that the company would make every effort to sell the acid rather than discharge it to the Grand Calumet River. The company has advised that all hydrochloric acid is now being sold, and that no chlorides or acid from this operation are being discharged to the river.

An accidental spill occurred in December 1963, at the American Oil Company dock in the Lake George Branch of the Indiana Harbor Canal. A barge containing about 10,000 barrels of highly toxic toluene was being unloaded when suddenly the bow of the barge sank with three valves open. An unknown amount of toluene escaped into the canal during approximately fourteen hours before the leak was controlled. As far as is known, no serious damage resulted from the spill. This was partly due to the high volatility of the toluene which evaporated rapidly.

I might insert that it has been reported that the diving suits dissolved when the men attempted to close the valves of the toluene, which created quite a problem.

Water quality: The Grand Calumet River and Indiana Harbor Canal are grossly polluted and are generally characterized by unsightly appearance in the form of floating debris, oil, discoloration and turbidity.

Channel banks, structures and boats acquire a black coating from oil or tarry substances. Malodorous conditions are prevalent and frequent. There is no dissolved oxygen in the Indiana Harbor Canal. The lakeward reaches of Indiana Harbor are rust-colored from waste pickle liquor. The Grand Calumet River and Indiana Harbor are practically barren biologically with all that cyanide going in.

Although there are thick deposits that usually provide a suitable habitat for sludgeworms, extended septic periods and toxic pollutants prevent their establishment.

Sewage and industrial wastes discharged to the Grand Calumet River and Indiana Harbor Canal in Indiana are the principal pollutional loads that affect interstate waters of Lake Michigan.

We will show you some pictures of this rather interesting situation.

This is the headwaters of the Grand Calumet River in the Sand Dunes at Gary, Indiana. This is relatively clean water with a clean sand bottom.

MR. POSTON: What river is this?

MR. LE BOSQUET: This is the Grand Calumet River at the Dunes.

The reflections you see are the cloud formations; that is not pollution.

The next slide, please?

This is a high altitude view of the U.S. Steel Coke Plant at Gary. You will note the Grand Calumet River goes along in the foreground.

The next slide is a closeup of this same situation. There is a drag line dredge here on the left. Maybe you can see it. That is a six-foot sewer, by the way.

Next slide, please?

This is another six-foot sewer farther west from the U.S. Steel Coke Plant on the Grand Calumet River. We would expect phenol, ammonia and tarry materials from this.

MR. POSTON: This white material, what is that?

MR. LE BOSQUET: I presume that is oil. I wouldn't identify it specifically; probably some form. It must be -- maybe one of our aides here can answer that question.

MR. POSTON: Is this the Grand Calumet River again?

MR. LE BOSQUET: It is the Grand Calumet,yes.

A VOICE: Hard detergent.

MR. LE BOSQUET: Hard detergent.

(Laughter.)

Next slide, please?

This is the Grand Calumet farther downstream of U.S. Steel in Gary. It is a large six-foot sewer and now you see we have oil. That is an oil slick you see there, also solids.

Next slide, please?

I mentioned this dredge in the Grand Calumet. That is maintained there permanently. It moves up and down the river and recovers the residual iron deposited from the residual gas wash water settled effluent. This is not the primary removal, you understand. This is just the residual after a rather brief period of settling.

MR. KLASSEN: What happens to the dredging material?

MR. LE BOSQUET: I believe it is recovered and reprocessed. This is too good to waste.

Next slide, please?

This is a seven-foot outfall to the Grand Calumet from the Gary Sheet & Tin Mills, U.S. Steel. Note the black oily waste added to the other oil from upstream. The chief characteristic of this stream seems to be the oil slick that is extended over the whole length.

MR. POSTON: This is again the Grand Calumet?

MR. LE BOSQUET: This is the Grand Calumet.

Next slide, please?

These are outfall sewers to the Grand Calumet River from Cities Service Petroleum Company of East Chicago. These large outfall sewers, each about five feet in diameter, are on each side of the Cline Avenue Bridge. This picture was taken looking north.

Next slide, please?

This is duPont in East Chicago to the Grand Calumet and this is one of several discharges. Note the gauging and sampling station on the ditch. This is pure organic chemical waste.

Next slide, please?

This is the Hammond Sewage Treatment Plant on the Grand Calumet River. Sometimes the river at this point flows east to the Indiana Harbor Canal; sometimes west. This is looking south and this is Columbia Avenue on the right.

Next slide, please?

This is the East Chicago sewage treatment plant, Grand Calumet River. We have the Indiana Toll Road in the background. This river here usually flows east to the Indiana Harbor Canal. This picture is looking south along Indianapolis Boulevard.

Next slide, please?

This is a picture of the two parts of the Grand Calumet River in the foreground flowing into the Indiana Harbor Canal looking towards Lake Michigan to the north.

The Indiana Harbor Canal intersects the Grand Calumet River at this point. In other words, low on the slide, the Calumet River from the east comes in on the right and the Calumet River on the west. The Grand Calumet comes in on the left.

The next slide is a closeup of this picture. This shows the same situation. Most of the flow is from the east. You will notice the oily sludge banks.

Next slide, please?

This is the Indiana Harbor Canal at Dickey Road, East Chicago. The outfall sewer you see there is from the Youngstown Sheet & Tube Company. This is looking towards the lake.

We also see the typical oil slicks we find in these waters.

Next slide, please?

This is the Indiana Harbor Canal and that is the Inland Steel Company ore pile. This is heavy oil flowing towards the left which is towards Lake Michigan.

Next slide, please?

MR. POSTON: What is this located on?

MR. LE BOSQUET: This is the Indiana Harbor Canal. That is the -- I think it is near the E.J. & E. Railroad, right in there somewhere.

Next slide, please?

This is a high elevation view of the

Indiana Harbor Canal looking west at the Pennsylvania Railroad bridge. The Inland Steel Company is in the foreground; Youngstown Sheet & Tube in the background. The flow is from the left to the right, toward Lake Michigan.

MR. POSTON: These markings on the surface of the water, what is that?

MR. LE BOSQUET: That is, I believe -- this would be an oil slick that we see all over this area.

MR. POSTON: Those black marks, black in appearance?

MR. LE BOSQUET: Well, oil often is black. We have some pictures showing it very black.

Next slide, please?

This is a closeup view of that same situation. It shows the Youngstown Sheet & Tube Company outfalls. There is very heavy oil coming in from both sides. The flow is from left to right towards Lake Michigan.

Next slide, please?

This is that same Pennsylvania Railroad bridge looking east, and those are Inland Steel Company outfalls. The flow is at this time from the right to the left.

Next slide, please?

This is the Indiana Harbor Canal looking east. That is the Inland Steel Company in the background. There appears to be a number of varieties of oil in this picture. The flow is from right to left.

The oil added can be different shades from the oil that is there before.

Next slide, please?

This is the Indiana Harbor Canal with the Youngstown Sheet & Tube in the background. The flow here is from the left to the right. This is the E.J. & E. Railroad looking west. It is another picture that shows the oil slicks.

MR. POSTON: Do these sewers that we see here emptying out -- there are two there adjacent -- provide treatment before discharge?

MR. LE BOSQUET: I couldn't answer that without checking the file through. Many of them do have some separation.

One of the things you have to keep in mind is this -- practically all these cases are residual pollution. It is not saying that these industries haven't done a tremendous job. There is just so much. They are so complex, and the residual is our problem.

Next slide?

This is the E.J.& E. looking west; and

looking west on the Indiana Harbor Canal is the Youngstown Sheet & Tube.

A VOICE: That is on the right.

MR. LE BOSQUET: Youngstown Sheet & Tube is on the right.

You see those outfalls and you can understand the problem of our field men in gauging and sampling those large outfall sewers.

Those particular sewers, for example, are five and eight feet in diameter.

The heavy oil is flowing toward us.

MR. POSTON: This is another sewer on the left hand side of the picture?

MR. LE BOSQUET: Yes, I think we have a picture of that in the next one.

That is a sewer there, the one that you saw on the left. This is looking east towards the Inland Steel Company. There is a boat shown here.

The large outfall, the flow is from right to left in this case. We are looking east.

Next slide?

This is a four-foot sewer of the Youngstown Sheet & Tube Company discharging to an inlet to the Indiana Harbor Canal. You don't get the full benefit of these colors.

Incidentally, we have prints of these pictures which we will put up later, so you can look at these more carefully. These are very colorful.

MR. POSTON: You mean this sewer is four feet in diameter?

MR. LE BOSQUET: That's right. You can see that truck there. Sometimes,you have to have some sort of a scale to appreciate how large some of these are.

Next slide, please?

This is the Indiana Harbor Canal turning basin. This is looking west. The Inland Steel Company is in the foreground; Youngstown Sheet & Tube in the background.

The Indiana Harbor Canal enters from the left. The open lake, Lake Michigan, is at the right.

The visible wastes are the black oil that you see, especially in the near part of the picture and the red is spent acid pickle liquor.

The next two show --

MR. POSTON: Do these discolorations stay here in the turning basin, or what happens to this material?

MR. LE BOSQUET: Well, I imagine that iron, being such as it is, neutralizes and some goes out. There is a certain amount of flushing. There is quite a flow going into this particular turning basin.

MR. POSTON: Yes, but where does it go?

MR. LE BOSQUET: I notice up where the Indiana Harbor Canal comes from the left, you can see the differentiation between the water in the turning basin and the waste in the canal which indicates the amount of water -- we estimate about 2,000 cubic feet per second coming out of that canal, so that it maintains its current integrity.

MR. POSTON: Well, this 2,000 cubic feet per second that you talk of, where does that go? Just in the turning basin, does it stay there?

MR. LE BOSQUET: That goes from here. It goes out into the Lake, the Lake which is on the right there.

MR. POSTON: I see, out into Lake Michigan.

MR. LE BOSQUET: The next detailed two slides will show each in the lower right. I might explain that this picture that we just passed by, this is the picture that you observed when you fly into Chicago from the east, and everytime I come in, I look over it, especially in the daytime, to see if it looks differently, and you get a very excellent view flying from the east, because the flight channel, as I recall it, is right over this particular area.

This is a close-up detail of the turning basin. It shows the oily wastes. These are black, and the discoloration from the pickle liquor, acid pickle liquor. A barge has entered the picture since these two pictures were taken.

The next slide, please?

This is a picture which shows the same turning basin and we have the black oily wastes on the left and the yellow-red acid pickle liquor on the right.

Now, that is what we conjecture those are.

Now, if we can have some lights, we will go on to the next.

MR. POSTON: Mr. Le Bosquet, you flew over this area in a helicopter for a period of about three hours here last month. You studied in this area in the 1920's.

Do you have any comparisons with your impressions on this trip?

MR. LE BOSQUET: Going by U.S. Steel, which in those days was known as the Illinois Steel Company, it looked about the same.

(Laughter.)

I can remember some of those outfalls at the time. I can't say that it is the same, I don't believe it is; but just from a superficial recollection. You realize that this is quite a while ago.

(Laughter.)

It's been pointed out to me that this is quite a while ago.

The Calumet Channel, Blue Island to Lake Michigan: The Calumet Channel from Blue Island to Lake Michigan connecting the Calumet-Sag Channel and the lake, consists of the navigable portion of the Little Calumet and the Calumet Rivers. Waters entering this section are the Little and Grand Calumet Rivers and the Wolf Lake. Water generally also enters from Lake Michigan.

Flow reversals: The direction of flow in the Calumet River under normal conditions is from Lake Michigan toward the Calumet-Sag Channel. This flow is induced by the hydraulic control of the sanitary and ship canal system maintained by the Metropolitan Sanitary District in connection with the diversion of water from Lake Michigan for dilution purposes.

The Blue Island controlling works, owned and operated by the Sanitary District, is one of the points of diversion from Lake Michigan.

The record low stages of Lake Michigan during the past year have contributed to reversals of flow in the Calumet River under two different sets of conditions:

(1) A rapid drop in the lake level, and (2) a major storm.

With the present low lake stages and the requirement to maintain a nine foot navigation depth in the Calumet-Sag Channel, the hydraulic head at the Blue Island controlling works is minimal, varying from zero to a few tenths of a foot most of the time.

Local variations in the level of Lake Michigan of 0.5 to 1.0 foot due to wind and/or barometric pressure effects are common. These changes occur in a few hours' time, and the effect may persist one or more days.

When the lake drops a half foot or more at Calumet Harbor, this can produce a hydraulic gradient which causes the Calumet River to flow toward the lake for periods ranging from a few hours to more than one day. This may occur even though the lock gate at the Blue Island Controlling Works are fully opened in an effort to induce the flow to the Calumet-Sag Channel.

You might say the day that Mr. Poston and I flew over this area, the Blue Island Canal was wide open.

(2) Major storms which produce excessive runoff in the Little Calumet River Basin in the past have resulted in occasional flow reversals in

the Calumet River. These have been due to the inability of the Calumet-Sag Channel to carry the flood flows away from the area fast enough, or to operation of the Blue Island Controlling Works for prevention of flood damage in the area.

The duration of these flow reversals varies greatly, depending on the storm rainfall distribution. It was estimated that the Calumet River flowed into Lake Michigan for about 72 hours during the storm of October, 1954.

During the storm of July, 1957, when flooding became critical in the Calumet-Sag Channel, the lock gates at Blue Island Controlling Works were opened to permit a flow out of the Canal toward Lake Michigan. The entire Calumet-Little Calumet system flowed into Lake Michigan for several hours.

In September 1961, heavy rains on the 13th and 14th resulted in general flooding which caused the Calumet River to flow into the lake for several hours.

The Metropolitan Sanitary District operates recording water level gauges located on the Little Calumet River at the Acme Steel Plant and on the Calumet River near its mouth.

The recorder charts for the period of

January through March, 1964, were examined for periods of flow reversal. On the basis of 12-hour average gauge heights obtained by inspection, eight periods of flow reversal were found. The duration of reversal varied from 12 to 36 hours.

The Thomas J. O'Brien Lock and Dam will provide a positive barrier between Lake Michigan and all of the municipal treatment plants and some of the industrial waste sources on the Little Calumet-Calumet system.

When the O'Brien Lock is put into operation, these wastes will be excluded from the Lake, except during infrequent periods of major flooding when the control gates might be opened to alleviate flood damage.

Water uses: The Calumet River and the navigable portion of the Little Calumet River are used for navigation, industrial water supplies, receipt of municipal and industrial wastes, and recreational boating.

A number of parks, golf courses and forest preserves are located along the banks of the Little Calumet River. These are made less attractive because of unsightly streams. The Cook County Forest Preserve District has not developed picnic areas along the Little

Calumet River because of its polluted condition.

To provide water-oriented recreation, an official of the Forest Preserve reports that a policy of building lakes and ponds in the interior of the preserves away from the polluted streams has been adopted.

Municipal wastes: The Calumet Plant of the Metropolitan Sanitary District of Greater Chicago is by far the largest sewage treatment plant in the whole Calumet area. It discharges 50 percent of the residual municipal waste after treatment in the Illinois River portion and 40 percent of the residual municipal waste in the entire Calumet area.

Effluent disinfection is not practiced, and no plans for disinfection have been announced.

The Calumet plant serves the southeast part of Chicago and many suburbs such as Blue Island, Calumet City, Riverdale and Dolton. It receives and treats domestic and industrial wastes.

Particularly significant, it treats coking wastes from the steel plants located along the Calumet River in Chicago so that phenolic and other constituents of these wastes receive secondary treatment.

The Sanitary District operates three small sewage treatment plants in the Calumet area, each achieving 85 percent or higher biochemical oxygen demand removal efficiency. These plants are at East Chicago Heights, Hazelcrest and Orland Park.

In addition, the Sanitary District supervises through analytical control 19 additional small operations. These small operations show between 80 and 90 percent BOD removal efficiency.

Three of these latter small plants will be eliminated within six months and become part of the interceptor system in accordance with the overall policy of the Sanitary District pertaining to such installations.

Chlorination is carried out at all small Sanitary District treatment plants, and a number of small private plants in the district have begun chlorination.

Except as otherwise noted, all domestic wastes from industries in the Calumet area either are connected to municipal systems or receive secondary treatment at the site.

There is a storm water overflow at the Metropolitan Sanitary District Calumet Treatment Plant. In addition, a pumping station operated by the Metropolitan Sanitary District, located at 95th Street near the Calumet River, at times discharges combined sewage to the river through the Howard Slip, about one river mile from the Calumet Harbor.

This discharge will reach Lake Michigan

if the Calumet River flow is toward the lake at the time of discharge. Since the pumping takes place during severe storms, it is likely to coincide with river flow toward the lake. This overflow is likely to contain coking wastes from steel plants located on the Calumet River. Pumping to the Calumet River from the 95th Street Pumping Station is confined to severe storm periods and has varied from only two to 100 hours per year.

The pumping station outfall is located between the O'Brien Lock and Lake Michigan and will therefore continue to discharge to the lake during flow reversals, even after the O'Brien Lock is put into operation.

Industrial wastes: The principal sources of industrial wastes that discharge into the Calumet-Little Calumet navigation channel are the United States Steel Corporation, South Works; Wisconsin Steel Works; Interlake Iron Corporation; Republic Steel Corporation; Cargill, Inc., all in Chicago; Lever Brothers, Hammond, Indiana; and Acme Steel Company, Riverdale, Illinois.

Their wastes are summarized as follows:

U.S. Steel Works, South Works, 210 million gallons per day; ammonia nitrogen, 990 pounds per day; phenol, 250 pounds per day; oil, 7,700 pounds per day.

Wisconsin Steel Works, 40 mgd, population equivalent, 2,200; ammonia nitrogen, 110 pounds per day; phenol, 10; and oil, 800 pounds per day.

Interlake Iron Corporation, 37 million gallons per day, 20,300 population equivalent; ammonia nitrogen, 700 pounds per day; phenol, 900 pounds per day; and oil, 260 pounds per day.

Republic Steel Corporation has 85 million gallons per day. All we have is 80 pounds of phenol.

Cargill, Inc., 4/10ths million gallons per day, population equivalent is 8,700.

Lever Brothers, Hammond, Indiana, 10 million gallons per day, a population equivalent of 18,000. This goes to Wolf Lake.

Acme Steel, Riverdale, 48 million gallons per day and a population equivalent estimated at 4,300.

I might say about some of these results being 24-hour composites might not be too accurate.

MR. POOLE: How many of these are between the O'Brien Locks and the lake?

MR. LE BOSQUET: I would say all but the Acme Steel.

MR. POOLE: And Lever Brothers?

MR. LE BOSQUET: No, Lever Brothers is on Wolf Lake which is also --

MR. POOLE: Someplace between, that's right.

MR. LE BOSQUET: That's right.

MR. POSTON: You indicated that some of these results are results of 24-hour composite samples. Does this mean that the averages could be higher?

MR. LE BOSQUET: Well, we have industrial information from one or two plants that indicated their actual figures are much higher. Others, I am sure, might be lower.

We also get into the problem of what is an oil, and this oil is by Standard Methods; and some of the oil companies don't agree to this as a proper definition.

However, as far as I know, that hasn't been a problem in this area.

The United States Steel Corporation, South Works, Chicago, Illinois, has no coke plant. Its principal wastes are blast furnace flue dust, oil, and hydraulically quenched blast furnace slag known as popcorn slag.

Located at the very mouth of the Calumet River, U.S. Steel discharges wastes both to the river and to Lake Michigan. The amount of flue dust that overflows the thickeners is not known, but discoloration of Calumet Harbor and Lake Michigan is evident from the air.

I will show you the picture. The company provides oil separaters.

Popcorn slag at times is discharged and washes ashore at such places as Calumet Park Beach in Chicago where it becomes a nuisance to bathers. No significant amount of pickle liquor is discharged.

Wisconsin Steel Works, Interlake Iron Corporation, and Republic Steel Corporation, all in Chicago, have their coke plant wastes sewered to the Calumet Sewage Treatment Plant.

The Public Health Service studies,however, indicate that some coke wastes are probably discharged to the Calumet River by Interlake Iron Corporation.

Only Republic Steel Corporation discharges a significant amount of pickle liquor. It has not been reported whether this pickle liquor is neutralized before discharged.

All three plants provide settling tanks or thickeners for recovery of blast furnace flue dust. Some popcorn slag has been traced to the Wisconsin Steel Works.

Cargill, Inc., Chicago, Illinois, provides septic tanks for sanitary wastes. Wastes from refining soybean oil contribute 8,700 population equivalent to the

Calumet River.

An industrial waste treatment plant providing neutralization and anaerobic-aerobic treatment has been constructed, but has not been reported to be in operation.

Lever Brothers Company, Hammond, Indiana, discharges about 18,000 population equivalent to the extreme northern end of Wolf Lake. Several acres of the lake have been polluted and fish kills have been reported. Tainting of the flesh of game fish caught in Wolf Lake has been reported, and I might say the fish seem to swim interstate.

Acme Steel Company, Riverdale, Illinois, discharges raw sewage from approximately 2,900 of its employees. It also discharges a substantial amount of unneutralized pickle liquor. The company provides scale pits, oil separaters and a thickener.

Acme Steel Company is drawing plans to separate the sanitary wastes from the combined system so that the sanitary wastes may be discharged to the existing sewer system.

Further, plans are being made for revision of production operations needed for the installation of acid pickle liquor waste disposal system.

CHAIRMAN STEIN: Mr. Le Bosquet, just for the purpose of clarification, I notice here you are using the term "sanitary wastes" throughout. For the people in the audience, this might mean a contradiction in terms. What do you mean by sanitary wastes?

MR. LE BOSQUET: Well, I mean human wastes.

CHAIRMAN STEIN: You mean human wastes?

MR. LE BOSQUET: Yes, there is a lot of it in this area.

(Laughter.)

CHAIRMAN STEIN: You know, this field has the most antiseptic terminology you ever saw. I don't know that the sanitary wastes implied is necessarily sanitary.

MR. LE BOSQUET: Well, it is well known to sanitary engineers and we call it bread and butter.

(Laughter.)

Water quality: Biological studies showed that the Calumet River from its confluence with the Grand Calumet River to its mouth in Calumet Harbor is severely degraded. The stream was highly turbid. Oil slicks and floating sewage solids were observed.

At stations at the mouth and five miles upstream from the mouth, the bottom was composed mainly of organic ooze that had a sewage and petroleum odor. Near the mouth of the Grand Calumet River, the bottom deposits of the Calumet River were composed of inert or inorganic materials.

Only very pollution-tolerant sludgeworms existed in the reach from Lake Calumet downstream. Downstream in this case means away from Lake Michigan.

From Lake Calumet upstream more towards the lake, sludgeworms dominated, but the presence of fingernail clams indicated a slight improvement in water quality and bottom conditions. Sludgeworms averaged more than 5,000 per square foot in this stream reach.

Attached filamentous algae routinely scraped from under water surfaces in this river were very pollution-tolerant blue-green forms. No pollution-sensitive filamentous forms were found.

The Calumet River exhibited average coliform densities of 2,900 per 100 ml near its junction with Lake Michigan, increasing to 24,000 per 100 ml about three miles farther inland.

Interstate pollution occurs with reversals of flow in the Calumet River. Both municipal and industrial wastes from Illinois enter Indiana waters of Lake Michigan which lie about one-third mile off shore. I was looking at the map the other day and I found that you could stand on the pier in Calumet Harbor and dive into Indiana; that the Indiana line, apparently, coincides with this bulkhead.

In addition, blast furnace flue dust and oily wastes have been observed to flow from U.S. Steel, South Works, into Indiana waters.

The United States Lake Survey of currents in Calumet Harbor show that strong northerly winds produce a strong southeast current through the harbor. This current would carry pollution along the Indiana shore line.

Unquestionably, the flow reversals are detrimental to beaches and other water uses in Illinois along the shore line immediately adjacent to the mouth of the Calumet River.

Now, we might stop for a moment to show you some more pictures.

This is a high altitude -- well, not too high -- picture of Wolf Lake in Indiana. That is the Indiana Toll Road to the left; Hammond parks are at the right and Lake Michigan is in the background.

The American Maize-Products Company and their waste treatment lagoon is shown at the left of the channel, and Lever Brothers is at the north end of the channel.

The original Wolf Lake channel to Lake Michigan is now blocked. That is in the background. That is blocked.

The next slide?

This is a close-up picture of that former lake channel. The American Maize Products Company has a waste treatment lagoon in the foreground. There is an anaerobic section on the right there of the lagoon and is partly covered to conserve heat in the cold weather. The aerobic section has a mechanical aerator which is operating. It wasn't operating the day that Mr. Poston and I were flying over it.

Treatment wastes -- it was zero, incidentally.

MR. POOLE: Those are not connected to Wolf Lake, however, Mr. Le Bosquet.

MR. LE BOSQUET: That's right.

Treated wastes are discharged to the Hammond Sanitary District and to Lake Michigan, but not to Wolf Lake.

You were one sentence ahead of me, Mr. Poole.

MR. POOLE: It's good to be ahead of you.

(Laughter.)

MR. LE BOSQUET: Lever Brothers Company, in the background, discharges wastes to the north end of Wolf Lake Channel. Hammond Water Plant is at the shores of Lake Michigan.

The next slide, please?

This is the Calumet Sewage Treatment Plant of the Metropolitan Sanitary District of Greater Chicago. This activated sludge plant is the largest sewage treatment plant in this area by a considerable portion.

Next slide, please?

This is the Acme Steel Company, one of the 15 outfalls that they have. This is the Calumet River at Riverdale. Untreated sewage is discharged from the plant. We can see visible wastes as far out as we can see; solids, pickle liquor.

Next slide, please?

This is a marina on Calumet River near the junction of the Grand Calumet River on the right here. You can't see it. This picture is looking northeast.

The next slide, please?

This is soybean processing wastes to Calumet River from Cargill, Inc., Chicago. You will notice that in this particular picture, the river is flowing to Lake Michigan or from left to right.

MR. POSTON: Does this waste receive any treatment?

MR. LE BOSQUET: This waste is -- I am not too sure. It is not a tremendous --

A VOICE: Yes.

MR. LE BOSQUET: We have a "yes" from the audience. I don't have it recorded.

Next slide, please?

This is a picture that Mr. Poston and I took on a day when it was zero outside. We put it in because to me it was a rather sensational picture, mostly because of the weather. You don't get fumes coming up from the Calumet River except when it is zero outside, and of course, you have a lot more condensation of the steam during such weather conditions.

This is the Calumet River at Wisconsin Steel on the right. That's right, isn't it?

A VOICE: Republic.

MR. LE BOSQUET: Republic, I'm wrong; yes, Republic Steel on the right; U.S. Steel is behind the steam.

Next slide, please?

This is a picture of oily wastes in the Calumet River from the Republic Steel Corporation in Chicago. Lake Michigan is on the left. There doesn't seem to be much of a flow at this point.

Next slide, please?

These are more outfalls to the Calumet River from the Republic Steel Corporation. This is looking east.

The bridge carries a gasline from Interlake Iron Corporation between the coke plants on one side and the blast furnace on the other.

MR. POSTON: What is this waste?

MR. LE BOSQUET: You can see the oil slick on this river.

Next picture, please?

This again is Republic Steel Corporation. We take it from the color that that is waste acid pickle liquor discharged to the Calumet River.

Next slide, please?

This shows Republic Steel in the foreground. Across the river, there is the intake, the Interlake Iron Corporation. This picture is interesting. It shows that the waste flow is from the outfall over into the intake.

(Laughter.)

Next slide, please?

Apparently, this is the Wisconsin Steel Works of the International Harvester Company in Chicago. This again is the color of acid pickle liquor.

Next slide, please?

This is the U.S. Steel Corporation, South

Works, in Chicago on the north bank of the Calumet River. An outfall sewer is to the left. At the left edge is a discoloration. It is a little difficult to see in this picture. Is this --

MR. POSTON: How big is that sewer there?

MR. LE BOSQUET: This is Wisconsin. I stand corrected. This is Wisconsin Steel Works.

You will notice there we have mentioned the settling tanks and thickeners several times. Now, that is one of them.

The length of time is rather brief in these, but they do carry out -- take out the heaviest material.

Next slide, please?

This is the U.S. Steel, South Works, at the north bank. There is a discoloration along the left edge here as you can bearly see in the slide. That is residual blast furnace flue dust. This would indicate to me that the river was flowing towards the lake when this picture was takmn.

MR. POSTON: Do you care to estimate the size of that sewer?

MR. LE BOSQUET: I don't know. Most of these are quite large, four to six feet at least, and we have some of them higher than that.

That is all the slides we have on the Calumet, and before going into Lake Michigan, which is a final section, are there any comments, Mr. Chairman?

CHAIRMAN STEIN: Are there any comments or questions?

Are you going to make summaries when you complete this, as to the total amount of ore, for example, going into Lake Michigan?

MR. LE BOSQUET: Yes. Well I have totaled it for Indiana Harbor and I will mention that on Lake Michigan.

CHAIRMAN STEIN: Yes.

MR. LE BOSQUET: It is a little difficult to total it for the Calumet River because you'd have to have some factor of reversal of flow, so that this cannot be done accurately.

MR. POOLE: Mr. Chairman?

CHAIRMAN STEIN: Mr. Poole.

MR. POOLE: Your table, or one of your slides showed oil in the vicinity of Republic's plant, as I recall it, and your table has a dotted line under the oil column for Republic. What does that mean?

MR. LE BOSQUET: That explains that -- I explained that this is based on one -- in some cases two -- 24-hour composites and also in industries that take water from the Calumet River. There is quite a substantial amount of oil in the water supply and you can't properly charge this to the industry.

In fact, you will find some of these plants, no doubt,have a negative oil contribution and that they pump their water supply from one of these waters, treat it and use it and add oil to it, but they don't add as much oil as they take out.

This is the kind of factor that you cannot explore in one 24-hour composite.

MR. POOLE: Let's see if I know what you are saying. Are you saying that in your judgment there is no oil from Republic that reaches the river? Is that what you are saying?

MR. LE BOSQUET: No, I am saying that you cannot get accurate results based on one 24-hour composite, and I would not testify with a high degree of accuracy on any of our industrial waste results.

By and large, they are an indication of the order of magnitude, and I would suspect that there is some oil coming from Republic Steel.

CHAIRMAN STEIN: Mr. Le Bosquet, would you think there are significant amounts of oil in the Calumet River system?

MR. LE BOSQUET: Oh, yes. There are significant amounts, of course, amounts which you can see on the surface; and if you can get your oil low enough, these will disappear. You will still have oil but you don't have the slicks; but with the heavy slicks that we have in the Calumet River, as you saw from those pictures, I will say that they were significant.

I won't say there is a large amount if you want to compare it. The amount of oil going into the Calumet is less than that in Indiana Harbor, quite a good deal; and also it goes down -- most of it goes down the Illinois River.

CHAIRMAN STEIN: But it is still oil, wherever it goes?

MR. LE BOSQUET: Yes, that's right.

MR. KLASSEN: Mr. Le Bosquet, do you have any estimate of the time of reversal of flow of the Calumet? What percentage of time does the Calumet flow during your study toward the lake or toward the Illinois River?

MR. LE BOSQUET: Well, the Sanitary District has that recorded and we confined our exploration, you might say, to examining just by visual observation, to confining ourselves that it was a substantial part of the time.

And to get that information, we just looked, just a couple years recent records, so I cannot say what percentage of the time the Calumet River does reverse.

CHAIRMAN STEIN: Again, that is a significant amount of the time?

In other words, let us see if I can phrase this: Is the reversal of that river frequent enough to cause concern about the waste being put in the river having an effect on Lake Michigan?

MR. LE BOSQUET: Yes, I think that is a fair statement. It comes in the form of slugs during these reversal periods, and some of these have been quite substantial but not too frequent.

MR. CHESROW: I would add that it is not frequent at all and that the statement is not correct.

We will go into the detail of that in our presentation.

MR. LE BOSQUET: Fine. I will expect that you would get other figures; however, I do know that looking at that stream, I have observed the reversal on several occasions.

MR. CHESROW: We will present the information in detail.

MR. LE BOSQUET: Good, good, fine.

MR. POSTON: With the closing of the O'Brien Locks, the new locks, this will prevent considerable amounts of waste from going back to the lake, is that right?

MR. LE BOSQUET: Yes, that's right. There will not be as much flow to carry the wastes.

See, most of these industrial concerns, all but Acme Steel, are below; that is, towards the lake from O'Brien Locks, but those locks will certainly reduce the amount of reversals.

MR. POSTON: There will not be the opportunity for waste from the Calumet Sewage Works to get back out into the lake after the closing of the O'Brien Lock?

MR. LE BOSQUET: No, that will be over. No, the Calumet Plant is west of Lake Calumet, if I remember rightly, and that will go below -- west of the O'Brien Locks.

MR. POSTON: Where on that map does the effluent from the Calumet waste treatment works go into the river system?

Then, the O'Brien Locks are --

MR. LE BOSQUET: Between that and the lake.

MR. POSTON: So that will, in effect, form a dam that will prevent this treated effluent from getting back out into the lake?

MR. LE BOSQUET: The industries, however, by and large, are on the lake side of the lock and dam.

We mentioned Acme as the only one, shall we say, downstream to the left or west of the O'Brien Locks.

CHAIRMAN STEIN: Are there any further questions or comments for Mr. LeBosquet up to this point? If not, we will stand recessed for lunch. I understand there are ample facilities in this building and we will continue with Lake Michigan at that time. Thank you.

(Whereupon, a recess was had
until 1:45 o'clock p.m.,
this date.)

AFTERNOON SESSION

CHAIRMAN STEIN: May we reconvene?

Mr. LeBosquet.

MR. LE BOSQUET: The last of the five sections I was going to discuss was Lake Michigan. The area of Lake Michigan under present consideration extends from the Cook-Lake County, Illinois line, to east of the mouth of Burns Ditch in Indiana.

Attention has been concentrated, however, on effects of pollution on the water quality south of the Chicago Loop.

Water supply: There are six major municipal water systems in Chicago and the adjacent Calumet area in Indiana which use Lake Michigan as a source of water supply.

The largest is the recently constructed Central District Filtration Plant near the center of Chicago. This plant serves a population of about 2,800,000 and pumps 606 mgd.

The second largest in Chicago is the South District Filtration Plant located just north of Calumet Harbor. This plant serves a population of 1,600,000 and pumps an average of 380 mgd.

The other users are Gary, 200,000 people and 24 mgd; Hammond, 112,000 people, 23 mgd; East Chicago, 56,000 people and 14 mgd; and Whiting, 8,000 persons and 1.5 mgd.

The Gary-Hobart Water Company is constructing a new municipal water plant at Ogden Dunes, Indiana, about two miles west of Burns Ditch. This plant will have an initial rated capacity of 16 mgd.

Nearly all of the independent water supplies in the Calumet area are surface supplies. The total pumpage, excluding cooling water, is about 2,760 mgd, of which about 2,480 mgd is pumped from the Lake Michigan Basin.

The steel industry uses about 2,400 mgd, 87 percent of the total. The petroleum refining industry uses 250 mgd, 9 percent of the total. The remaining 4 percent is used by the paper, food and chemical industries. Ninety percent of the industrial water pumpage is taken directly from Lake Michigan.

Recreation: Recreational activities such as swimming, boating, water skiing and fishing are engaged in by a large segment of the population of the Calumet area. During the summer, millions of people visit the beaches in Chicago, Gary and Indiana Dunes State Park. Hundreds of pleasure boats can be observed on Lake Michigan, and at times,there is a virtual parade of boats to and from the marinas and mooring facilities.

As the population grows, the need for recreational facilities will expand.

Lake Michigan and Wolf Lake provide the only swimming waters. The streams are not safe for swimming because of the bacterial pollution. The Lake Michigan beaches at Chicago, Gary, and Whiting are packed on summer weekends, but there is an increasing tendency for people living in the Calumet area to drive to the Indiana Dunes State Park or the Michigan beaches where the water is clearer and the sand is cleaner.

The Hammond-owned beach on Wolf Lake is used by thousands of swimmers and sunbathers. The Lake Michigan beach at Hammond has been closed for several years because of high coliform bacterial counts.

The popularity of water skiing has paralleled the growth in pleasure boating. Water skiing is a popular sport on both Lake Michigan and Wolf Lake.

In recent years, the growth of interest in pleasure boating has increased at a phenomenal rate.

Marinas, mooring facilities and launching ramps are hardly able to handle the peak traffic. There are now 24 such boating facilities in the area. This number would undoubtedly increase markedly if the sheltered waters of the area were not polluted.

The boat registration records of Indiana and Illinois show how popular pleasure boating has become. In the three Indiana counties bordering on Lake Michigan, there were 11,000 boats, and in Lake and Cook Counties in Illinois, there are 43,000 registered boats.

Many of the boaters of the area moor their boats in clear waters as far away as Saugatuck and Holland in Michigan. The waters of the Calumet River stain boat hulls with a tar-like substance that is unsightly and difficult to remove.

In the Calumet area, there are several water oriented parks that provide recreational opportunities for thousands of people. Marquette Park at Gary and Wolf Lake Park in Hammond are two of the larger parks of the area. Both are located on relatively clean waters. Calumet Park beach in Chicago is also heavily used, but the bacteria content of its water is higher than desirable, and accumulation of popcorn slag on the beach from steel mills make the beach unattractive to bathers because of its gritty texture.

Municipal wastes: Municipal sewage is not generally discharged directly to Lake Michigan in this area, although discharges may reach the lake through tributary streams. At least one city, Whiting, Indiana, has a combined sewer overflow which discharges directly to Lake Michigan.

Indirectly, sewage treated to various degrees, reaches the lake by way of Burns Ditch, Indiana Harbor and on occasion from the Calumet River.

Industrial wastes: The principal sources of wastes that discharge directly to Lake Michigan are Union Carbide Chemicals Company, Whiting, Indiana; American Oil Company, Whiting, Indiana; American Maize-Products Company, Hammond, Indiana; and United States Steel Corporation, Chicago; and wastes from the first three are summarized as follows:

Union Carbide in Whiting has 43 mgd, 99,000 population equivalent. They have 13 pounds of phenols.

American Oil Company, Whiting, Indiana, 97 mgd, 57,000 population equivalent, 3,800 pounds of ammonia, 1100 pounds of phenol and 3,950 pounds of oil daily.

American Maize-Products Company in Hammond, Indiana, 9 mgd and population equivalent of 44,000.

Union Carbide Chemicals Company has a quench water recirculation system. Other wastes are mostly soluble in water and no treatment is provided.

Recently, large amounts of pellets of material similar to polyethylene have been found washed ashore on the beaches in Chicago. It is believed that Union Carbide is a possible source of this material.

Conferees, here is a sample of the pellets.

American Oil Company provides oil separators on both process wastes, including water return flow, and secondary treatment on process wastes.

American Maize-Products Company discharges some wastes to the Hammond Sanitary District. Other wastes are treated in an anaerobic-aerobic lagoon and chlorinated before discharge.

I showed you a picture of that, you will recall, just before lunch.

A decrease of 80 to 90 percent in BOD in the lagoon system is reported.

In addition, the U.S. Steel, South Works, is located at the mouth of the Calumet and a number of sewers discharge directly into the lake. Also important are the discharges reaching the lake from the Indiana Harbor ship canal. Using rounded figures, the discharges previously discussed have the following totals, and what I have done here is added the totals to an earlier table.

1,150 million gallons a day, total flow; 630,000 population equivalent; 37,000 pounds of ammonia nitrogen per day; 3,500 pounds of phenol per day; 2,900 pounds of cyanide per day; 102,000 pounds of oil per day.

I might say that these are added at the outlets of the individual industries and it could be that some of these have become somewhat stabilized before they reached the lake and in the case of cyanides, they are probably oxidized and in the case of oil, 102,000 pounds of oil, it is reported that Sinclair was skimming oil from the lake from the Indiana Harbor ship canal, so that they may be reducing this.

But, these are the totals of those industries I listed for you this morning.

Lake currents: Intensive studies of currents and temperature changes were made by the Public Health Service in the Illinois-Indiana boundary waters from November, 1962 through July 1964.

The study used automatic recording current meters and free floating current measuring devices.

Additional current meter studies were conducted in the Calumet Harbor area during the summer and fall of 1963 by the U.S. Lake Survey.

The studies indicate a prevailing flow from south to north along the southern and adjacent southwestern portion of Lake Michigan.

The most important types of motion in water are mixing and transport. Mixing refers to the rate of dilution of a pollutant. Transport is the net movement of a water mass from one area to another.

During two specific periods, January 21-24, '63, and March 14-16, '63, the City of Chicago Water Department experienced severe taste and odor problems from water taken at the cribs.

On January 20, 1963, the odor threshold level at Whiting and Hammond were recorded at a value of 8 at both intakes.

As a frame of reference, the Public Health Service drinking water standards provide that the threshold of water shall not be over 3 in the finished water. This is the raw water, of course.

This value of 8 jumped four to five times by the following day and nearly 15 to 20 times by January 22nd.

The flow of water past the intakes was measured and found to be towards the northwest.

On January 24th, just two days later, the Chicago South District Filtration Plant recorded its first taste and odor problems in 1963. Taste and odor problems were not experienced farther to the north at this time, thus confirming the fact that the pollution occurred to the south, as shown by the water movement.

During the March 14th to 16th, 1963 period, there was a second occurrence of severe taste and odor problems at Chicago. A water flow during this second period was measured and was again from the south to the north.

We had water meters in the water at all these periods.

Mixing rates can vary widely depending on the weather conditions. During the times of waste and odor difficulties experienced by Chicago, both in January and in March, 1963 chemical analyses showed that the water mass was diluted about four times while in transit from the Whiting-Hammond areas to the Chicago intake.

Studies made during April 1963, near Chicago indicate that the dilution ratio following near calm conditions is less than five for currents up to one foot per second and five miles of travel, indicating that these pollution concentrations travel as a body pretty much.

Regardless of the season of the year, the prevailing flow in the Illinois-Indiana region is from the south, although flows from the north also occur. The winds over the lake during the summer are primarily from the south and southeast, and in the winter are from the northwest, both of which maintain the northward flow of water.

Based on independent results of continuous summer and fall studies, the U.S. Lake Survey concluded that the northwestward flow past the Calumet Harbor was a typical summer condition. This flow was reversed only by strong northerly winds.

Current speeds along the shore and in the upper layers moved between two and five miles per day for 60 percent of the time. A movement from the Indiana area to the Chicago vicinity will normally take from three to four days for average conditions. Under storm conditions or periods of high winds, it could travel the distance in less than one day.

Water quality: The effects of wastes entering Lake Michigan in the Calumet area on the quality of the lake and the uses made of it were studied by the Public Health service during the period from 1962 to 1964. Wastes entering Lake Michigan come from the Indiana Harbor Canal, from industries discharging along the shore line in Indiana and Illinois, from reversal of flow of the Calumet River in Chicago, to a lesser extent from the discharge from Burns Ditch in Indiana, and from at least one storm water overflow in Whiting, Indiana.

Between 1961 and 1963, more than 450 bottom dredgings were made in the lake area from Willamette, Illinois, to Indiana Dunes State Park and Lakewood about 30 miles.

The bottom animal communities in this area of Lake Michigan were composed of only a few different kinds of organisms. Sludgeworms and aquatic scuds were more numerous, but bloodworms and fingernail clams were sometimes abundant.

Of these four different kinds of animals, only one, the scud, is sensitive to pollution, preferring a clean sand or gravel bottom and relatively clean water.

Where the lake quality is subjected to deposits of organic materials, the conditions are more favorable for sludgeworms, bloodworms and fingernail clams.

Off shore from the Calumet area streams, pollution tolerant organisms averaged 400 per square foot, and there were only a few clean water associated organisms.

Along the Chicago shoreline, pollution tolerant organisms averaged about 1,000 per square foot of lake bottom and pollution intolerant forms averaged about 50 per square foot.

This more than two-fold increase in pollution tolerant organisms is attributed to an organic sediment that is more suitable a habitat for organisms such as sludgeworms and less favorable for clean water-associated organisms such as scuds.

The reason sludgeworms were less numerous offshore from the Calumet area was that the heavier suspended particles contained in wastes from the steel industry settle out before they are carried northward to the Chicago waterfront.

In addition, toxic and inhibitory materials are more highly concentrated in the Calumet area than off the Chicago shoreline.

The lower concentration of toxic substances in the Chicago area would permit larger populations of organisms to develop.

Further evidence that wastes from the Calumet area are deposited in the lake near Chicago is in the odors of the dredgings from this area of Lake Michigan.

Some of the dredgings from this sector along the shore contained organic sediments described as ooze.

Sewage odors were detected in some of the dredgings near shore from the Chicago River to Burns Ditch, and petroleum odors were detected in bottom muds from the Calumet area.

These dredgings, of course, are the dredgings made by the biologists in examining bottom deposits.

Pollution of this large area of Lake Michigan is especially serious because it tends to be irreversible; that is, the conditions that now exist improve but slowly with the cessation of present waste discharges.

In a stream where there is a current moving in one direction, there is a tendency for the bottom deposits to be scoured away; however, lake currents are weak and shifting and bottom deposits might move only slightly over a long period of time.

This comment about irreversibility I have changed a little for the reason that as far as dissolved matters are concerned, it is almost entirely irreversible, but as far as tastes and odors are concerned, and oils, if you stop them tomorrow, why, they would soon disappear.

Bacteriology: The offshore waters; that is, a mile or so off the Calumet area and the Chicago areas were studied during 1962 and '63 in a series of sampling cruises.

Coliform and fecal streptococcus determinations were made.

Virtually, none of these organisms were found in the deep water of the main body of Lake Michigan.

Highest coliform concentrations occurred in the waters extending from the mouth of the Calumet

River to the Indiana Harbor and out to a distance of approximately two miles offshore.

That is between those two peninsulas, you might say, going out in the lake.

Coliform densities as high as 7,000 per hundred ml were observed in this area.

In the zone extending on eastward to Burns Ditch, all determinations were 1,000 or less per hundred ml at a distance up to two miles offshore.

Coliform densities in the range of 100 to 1,000 were observed for a distance of five to seven miles extending outward from the Calumet Harbor area.

Such densities were detected at the Indiana-Illinois boundary lines running east and west in Lake Michigan, due north to Whiting.

The waters of the south end of Lake Michigan are thus shown to be receiving large loads of fecal pollution originating in the Calumet area and moving out into Lake Michigan.

I might say these cruises were made in fairly large boats so that the samples were collected offshore.

It was impossible to get in close so that these are the waters away from the immediate effects of the shore pollution.

Data from records of the Chicago Park District on the occurrence of coliform bacteria on beaches in the Calumet area and northward along the lake shore in Chicago have been examined.

Each beach was sampled on 20 to 30 different days during the bathing season each year.

You will find the table on page 37 of the blue book and there is a slide on this particular subject, if you will show it now.

The left hand part is, of course, at about 37th Street and those last three points are Indiana Harbor, Hammond, I believe, and Whiting.

Calumet Beach is where that big rising line goes on the lower curve. It is evident ha Whiting Beach and Hammond Beach in Indiana and Calumet Park Beach in Chicago are the most heavily polluted

So the last three beaches on the right, these beaches lie within the artificial bay created by the Calumet Harbor breakwater and Indiana Harbor, as was shown in this map just a couple minutes ago, and are directly subject to pollution by wastes discharged to Lake Michigan in the Calumet area.

Coliform density usually exceeds 1,000 per 100 ml and are often over 100,000 per 100 ml.

The beach at Hammond is closed to swimming by orders of the Hammond Health Department due to high coliform concentrations. The beach is posted for no swimming.

Put the lights on again, please.

The water intakes of Chicago's Dunne crib and South District Filter Plant are often affected by those polluted waters moving northward from Indiana and the mouth of the Calumet River.

Rainbow Beach and the filtration plant are immediately adjacent, and Dunne Crib is two miles offshore.

The bacterial records of water from both the plant and crib intakes substantiate the presence of waters carrying fecal pollution.

At times, the quality of the water abruptly worsens and coliform densities increase sharply.

During the last part of November, '63, for example, coliform densities as high as 5,800 were recorded through an eight day period.

Higher coliform densities have been recorded in other seasons and years since 1950.

The picture of the phenolic materials is pretty similar to the picture on tastes and odors so we will skip over here to tastes and odors on page 36.

Tastes and odors is the second paragraph, not the first.

The filtration plant in the City of Chicago reported that one of its most serious taste and odor problems occurred between January 24th and February 7th, 1963, lasting 15 days.

During this period, threshold odor numbers increased from the usual number of four to a maximum value of 50 at Dunne Crib and 15 at the shore intake.

Odors during this period were characterized as hydrocarbon.

This description is usually associated with industrial wastes.

These high odor numbers are reflected in the heavy use of carbon in an effort to remove the odor.

Associated with these objectionable odors were high ammonia nitrogen results.

Other periods referred to by the Chicago South District Filtration Plant as causing similar problems included March 3 and 4, '63, when threshold odor values of 8 at the shore and 12 at the Dunne Crib were reported.

On April 2nd to 7th, '63, threshold odor numbers up to 10 at the shore and 14 at the Crib were reported.

Again, these odors were reported as hydrocarbon.

Another critical period recently reported was a 20-day period from December 11th to December 31st, 1964.

During this period, an excessive threshold odor of the hydrocarbon -- that means it was a taste -- that the taste was described as hydrocarbon, was obtained at Dunne Crib and 16 was obtained at the shore.

The high threshold odor numbers in January and March 1963, were associated with movements of water from Indiana towards Chicago intakes.

Four Indiana water plants also take their water from Lake Michigan in the Calumet area.

The Gary-Hobart Water Plant reports that when high carbon dosages are required, hydrocarbon odors are always responsible.

Acute problems were experienced at this plant in January, February and March 1963, and less severe problems were experienced in January, February, March and December 1964.

Threshold odors and phenol analyses were not reported.

The East Chicago Water Treatment Plant reports that beginning December 15, 1964, a strong phenol odor was detected.

Threshold odor numbers for the next eight days ranged from eight to 35, maintaining 35 for three consecutive days.

Normal or average carbon dosages are 24 to 27 pounds per million gallons.

During these eight days, dosages were between 63 and 163 pounds per million gallons.

The Hammond Water Plant reports that when winds are from the southeast or northeast, intensive pollution due to phenols is experienced.

In the past, phenols were experienced only during winter months, but they are now expected at any time.

Threshold odor numbers of 2,500 or higher have been recorded.

On March 24th and 25th and April 2, 1964, a severe taste was experienced characterized as a gasoline or paint type.

This continued with less severity for two weeks.

An insecticide spill was identified on July 10th and 11th, '64, which took one week to eliminate from the system.

During December 1 to 26, 1964, threshold odors from 30 to 79 were experienced for 77 percent of the time.

Whiting, Indiana, is located with industrial plants in close proximity on both sides.

Industrial pollution never ceases to be a problem. Threshold odors are usually high, running 15 to 25 when severe problems are absent.

During 1963 and '64, much higher average chemical dosages were required.

Only one period of phenol results was available. The results from January 16th to February 6th, '63, ranged from 1 to 26 micrograms per liter or -- this is commonly referred to as parts per billion, with an average value of 8 micrograms per liter.

Threshold odors during this period averaged 18 with a maximum of 100.

In contrast, during the week of December 24, 1964, threshold odors ranged from 300 to 2,000.

Because of the taste and odor problems reported in the first part of 1963, the Public Health Service began monitoring water intakes in Chicago and vicinity for organic contaminants.

This program was continued until June 1964. The stations selected were Whiting, Chicago's South District Filtration Plant, Chicago Avenue, Evanston and Waukegan.

The carbon absorption method was used for this study.

The Whiting, Indiana plant showed significantly greater amounts of carbon chloroform extract than the other intakes.

This is an indication of industrial pollution. An average value of 242 micrograms per liter found at this station can be considered a serious pollution load.

Threshold numbers up to 3,000 have been reported at Whiting.

The Public Health Service drinking water standards recommends a threshold of 3.

A study by Rosen and Rubin showed that 70 percent of the organic carbon in the carbon-chloroform extract from samples of intake water at Whiting, Indiana, was fossil carbon, originating from petroleum and coal, and indicated industrial sources.

The other 30 percent was contemporary carbon, indicating sewage origin or else it could be algae.

The carbon filter extracts from the other water plants indicate they are receiving organic pollutants in their raw water of the same magnitude as obtained in the South District Filtration Plant.

The pattern as far as nitrogen ammonia, organic and nitrate -- nitrate pretty much follows the same pattern as this taste and odors. In other words, originating in northern Indiana and following the currents up into the Chicago area.

On Page 43, you have information from the South District Filtration Plant.

I think it is significant and of interest and summarizes the situation.

During 1963 at the South District Filtration Plant, ammonia nitrogen results exceeded 0.02 milligrams per liter on 187 days. That is incorrect in that blue book if it isn't marked. (See "Report on Pollution of the Waters of the Grand Calumet River, Little Calumet River, Calumet River, Lake Michigan, Wolf Lake and their Tributaries, Illinois-Indiana." February 1965, page 43, para. 3, line 2.)

Shown below is a breakdown of the number of days this and higher values were exceeded at the Dunne Crib and at the shore.

Greater than 0.02, 182 days at the shore and 187 at the crib.

0.05, 72 and 77; 6 and 15; and greater than 0.20 milligrams per liter, 3 days at Dunne Crib.

CHAIRMAN STEIN: Mr. Le Bosquet, you are a true engineer. You may eliminate part of your text, but you never eliminate the --

MR. LE BOSQUET: Well, that's a City of Chicago table and I didn't feel at liberty to do it.

Ammonia problems are also reported by the Gary-Hobart Water Company which draws its water from Lake Michigan at Gary.

Gary-Hobart reports odors suggesting gasoline, and that high ammonia concentration are common in the raw water, the average magnitude being 0.10 milligrams per liter.

Water Company officials report that each pound of ammonia in the raw water increased the chlorine demand by 10 pounds.

On seven days during January 1963, ammonia concentrations ranged from .4 to .65 milligrams per liter.

On three days in March, the ammonia values were between .3 and .4.

During '64, ammonia values of .15 and .27 were reported on eight days in January, six days in February and one day in March.

Popcorn slag: Conferees, here is a sample of popcorn slag.

An investigation was conducted in September 1963, to determine the source of popcorn slag which fouls the Calumet Park Beach on Lake Michigan at 95th Street in Chicago.

Popcorn slag is a very light, porous solid which is formed by rapid cooling of molten blast furnace slag by water jets.

Some escapes the recovery facilities and is then discharged in washing or cooling water to the adjacent water course.

The slag floats and is moved by winds and current. Thus, it frequently collects on bathing beaches where the sulfide odor and gritty texture are both annoying and uncomfortable to bathers.

This problem is a more or less continuous nuisance throughout the summer.

Field investigations have indicated that at least two plants discharge this waste and the largest source of popcorn slag is the U.S. Steel Works, South Works, in Chicago, and a lesser source is the Wisconsin Steel Works in Chicago.

I understand that our field people spent a week out in the waters trying to find out where these slag contributions were coming from.

Now, I have some pictures of Lake Michigan which I would like to show you.

Before that, I want to apologize and say that this map is right as far as Calumet Beach is concerned, and also report that Acme Steel Company is no longer Acme Steel Company, that is the Interlake Iron Corporation, that it is still Acme Steel Company Plant and that describes it very well.

So if we will show a few slides, and then I will summarize it up very quickly.

This is the Central District Filtration Plant in Chicago, Illinois, which you all recognize, I am sure.

Next slide, please?

These are --

MR. POSTON: Just a minute.

I think it might be interesting to know that this is a $100 million investment in a water treatment plant for clean water for the people of Chicago.

MR. LE BOSQUET: Yes, and I think you can also see --

MR. POSTON: Just recently, it's been put into operation.

MR. LE BOSQUET: This is the largest filter plant in the world, I believe. It is really tremendous.

Next is the South District Filter Plant. Notice there is a slight bit of wash water coming over the left edge there, putting the mud back into the lake that they took out of the lake.

CHAIRMAN STEIN: Where do you want them to put it, in the tap water?

MR. LE BOSQUET: No, I am just presenting the fact, Mr. Chairman.

CHAIRMAN STEIN: Right.

(Laughter.)

MR. LE BOSQUET: Next slide, please?

This is the lakefront in Chicago at Grant Park on the left and there is McCormick Place somewhere along in there.

This shows the popular boating that we have today.

Next slide, please?

This is also a marina that is at East Chicago, Indiana.

That is Inland Steel Corporation in the background. The water intake for Inland Steel is right in this area.

Is that where it is?

Next slide, please?

This is the East Chicago Beach, the Universal Atlas Cement Company in the background. It is approximately the same location as the previous picture.

Next slide, please?

This is Marquette Park Beach in Gary,

Indiana. Indiana Harbor is in the background.

See, this is west of all we have been talking about -- east, rather, to the east.

Next slide, please?

This is the 12th Street Beach in Chicago. The foreground is the wife and small family of one of our technical staff.

MR. POSTON: Can we focus that in?

(Laughter.)

MR. LE BOSQUET: Focus that in a little more clearly.

These have been pictures of water use. Now, we go to the waste sources, and will you show the next slide, please.

This is the United States Steel Corporation in Gary, east of the main outfall, and this is evidently seepage of pickle liquor into Lake Michigan.

Can you show him the automobile to get a real idea of the scale. That is a truck, okay.

Next slide, please?

This is the Indiana Harbor Light. You can see the discoloration of water as it comes out of Indiana Harbor compared to what is on this side of the light.

There is continued filling across the bay there by the Youngstown Sheet & Tube Company looking west, therefore adding to these two peninsulas that enclose -- gradually enclosing the Calumet area.

Next slide, please?

This is a panorama of Lake Michigan at Whiting and East Chicago, Indiana.

The American Oil Company waste treatment plant is shown in the foreground. There is just a trace of a slick coming out from it.

The effluent from the Union Carbide Chemicals Company enters Lake Michigan near the center of the bay and Indiana Harbor is in the background with Youngstown Sheet & Tube in the middle distance and Inland Steel in the far distance.

A continued filling operation can be observed.

The American Oil Company, I might explain, provides secondary treatment for its processed wastes.

Next slide, please?

This is a six-foot sewer. It doesn't look very big, but that is a six-foot sewer from the Union Carbide Chemicals Company. Fifty million gallons a day is the flow from this sewer.

Next slide, please?

This shows the two outfalls of American Oil Company and a part of the sewage treatment plant -- the waste treatment plant, excuse me.

The next slide, please?

This is the U.S. Steel Company, South Works, Chicago, Illinois, and that is a five-foot sewer.

The visible effluent is the residual of blast furnace flue dust being discharged into Lake Michigan.

I would say that the right end of the picture is approximately the state line, so that discharge is very close at this point.

Next slide, please?

This is a higher view of the same situation. There is a discoloration on the right, mostly blast furnace dust. There is a dredge.

I would say that dredge is probably in Indiana.

The middle left is what appears to be an oily waste discharge. The Calumet River is there on the extreme left.

That completes the slides.

In winding up this report, I have a couple of pages of summary which you are welcome to read. I have a few comments at the end, however.

The DHEW Report recognizes the numerous water pollution control measures in operation in the

Calumet area.

Typical comments from the report are that nearly all municipal wastes receive secondary treatment, and I quote again "all of these plants --" this is within the Grand Calumet -- "have invested in waste treatment facilities."

The Calumet area is the site of one of the greatest industrial complexes of the country.

Water pollution control is likewise large and complex.

The residual waste after millions of dollars have been spent for control measures still constitutes a major problem.

Now, as far as the individual areas, in the Burns Ditch area, there is no evidence of interstate pollution.

Burns Ditch has some effect on the contribution of nutrients in the south end of Lake Michigan and contributes local bacterial pollution.

The effects of increased development in this area bear careful watching.

Wolf Lake receives the discharges of industrial wastes from one company in Indiana resulting in pollution of a portion of the lake and causing fish kills.

Tainting of the flesh of game fish caught in the lake has been reported.

Finally, in the Little and Grand Calumet Rivers, sewage and industrial wastes discharged in Indiana cause pollution of these waters in Illinois.

Sewage and Industrial wastes discharged to Lake Michigan and the Calumet River system, especially as discharged through the Indiana Harbor Canal in Indiana, cause pollution of the waters of Lake Michigan in Illinois and sewage and industrial wastes discharged to the Calumet River system and Lake Michigan in Illinois cause pollution of Lake Michigan in Indiana.

This pollution endangers the health or welfare of persons in a state other than that in which the discharges originate, and therefore is subject to abatement under the provisions of the Federal Water Pollution Control Act.

That completes my presentation, Mr. Chairman.

CHAIRMAN STEIN: Thank you, Mr. LeBosquet.

Just wait a moment to see if we have any comments or questions.

Are there any comments or questions?

MR. KLASSEN: Yes, I'd like to ask Mr. Le Bosquet a question.

Your compilation of your various waste

loadings, of course, were all important. There is one that I would like a little more information on.

I think you indicated 2,900 pounds of cyanide were discharged into the lake every day and we know that temperature and pH affects the oxidation and the lethal dose is .2 parts per million and you indicated the prevailing flow of the lake currents. (See self-correction on record, Page 364.)

The thing that concerned me about your statement is -- I hope I am quoting you correctly -- that probably this cyanide is oxidized.

I think that this is too important an item just to sweep under the rug by saying probably it is oxidized.

Do we know it is oxidized and to what extent does this cyanide loading into the lake extend until it reaches less than two-tenths parts per million?

CHAIRMAN STEIN: Mr. Le Bosquet, if you want to call on any of the staff on any of these technical questions, feel free to do so.

MR. LE BOSQUET: Yes, well, I get details, but I think in general it does oxidize rather rapidly.

I didn't point out that these were measured at the outfall and maybe several days before it actually gets into the river so that you have this period of time.

As far as your experience is concerned, does anybody have that?

This is Mr. Eklund, a staff member, whose wife you saw in the picture.

(Laughter.)

MR. KLASSEN: Who, incidentally, was not in the water.

(Laughter.)

MR. EKLUND: I will try to answer the question.

We sampled some selected outfalls where we had reason to think there might be cyanide, and we found that as far as -- I know I can be corrected by other people, but I think we never analyzed for cyanide in the lake or even in the rivers.

We did not investigate this, so to answer the question, we don't know the concentration of cyanide in the river or lake water.

MR. KLASSEN: In other words, the 2,900 pounds of cyanide going into the lake every day, you don't know what happens to it?

MR. EKLUND: That's right.

MR. POOLE: I want to clarify this a little bit. I believe the answer has been at least twice.

They don't know how much it is, but there is 2,900 pounds that originate in the sewers that discharge from various portions of the stream.

What is it when it gets to the lake and that is undetermined, apparently?

MR. LE BOSQUET: That is right.

CHAIRMAN STEIN: The point is with all that being discharged, you don't know what the effect is on the lake. You haven't analyzed that?

MR. EKLUND: That is correct.

CHAIRMAN STEIN: Do you know if anyone analyzed it?

MR. LE BOSQUET: We do know that aquatic life in that outlet channel is completely missing.

CHAIRMAN STEIN: The outlet channel is before it comes to the lake?

MR. LE BOSQUET: That is right.

There is probably a high degree of toxicity in the water along the main Indiana Canal, yes.

CHAIRMAN STEIN: By the way, I don't think this is an easy question to get around.

As I understood the thrust of Mr. Klassen's question, it was: If a large amount of cyanide such as has been recorded here has been discharged in reasonably close proximity to the lake into a watercourse that leads to the lake, don't you think we should have a pretty firm answer as to what happens to that stuff when it gets into the lake without relying on conjecture?

MR. LE BOSQUET: That would be highly desirable, yes.

MR. POOLE: Mr. Chairman?

CHAIRMAN STEIN: Mr. Poole.

MR. POOLE: I don't want to start introducing the Indiana report now, but -- as thick as it is -- but you won't hear all of it anyway, but here we have a sampling station at Dickey Road which is about as close as you can get to the lake by foot.

This is the Indiana Harbor ship canal.

Now, the average cyanide in 1960 was six-hundredths of a part per million and these samples are taken twice a month, and there was a maximum there of five-tenths of a part per million.

In '61, the average was one-tenth of a part per million and from a minimum of zero to eight-tenths of a part.

'62, the average was eighteen-hundredths of a part. It ran from zero to 1.7 parts.

'63, the average was two-tenths with a minimum of zero and a maximum of 1.3.

In '64, the average was two-tenths with a minimum of zero and a maximum of six-tenths.

I wouldn't want to stake my complete reputation on this assumption, but on the basis of those figures, I personally am not much concerned about the cyanide content at the waterworks intakes, and we have several independent waterworks intakes that are closer to this point that I have been discussing than the Chicago intakes.

CHAIRMAN STEIN: Are there any further questions?

MR. LE BOSQUET: I think a brief computation:

If you don't have any stabilization at all, this 3,500 pounds in 2,000 cubic feet a second works out to be perhaps three-tenths of a part per million.

CHAIRMAN STEIN: Thank you.

Colonel Chesrow.

MR. CHESROW: Do you have any reports on what happens after it gets into the lake? Is there any oxidation there?

MR. LE BOSQUET: No, sir. We don't -- it does oxidize in natural streams, yes, sir.

MR. CHESROW: When you say you have a controlling station there, to what extent do you carry out your control or is control carried out?

MR. LE BOSQUET: We have no controlling station there.

MR. CHESROW: There is no controlling station?

MR. LE BOSQUET: The State of Indiana, you're talking about?

MR. CHESROW: Yes, the State of Indiana said that they had a controlling station there.

MR. POOLE: That is just a sampling station, a monitoring station, to accumulate records on the quality of the ship canal at that point.

MR. CHESROW: Does the Federal study show what happens after it gets into the lake?

Is there oxidation or has no study been made?

MR. EKLUND: No study.

I would like to add one other thing, Mr. Poole?

I believe that all the blast furnaces from Youngstown Sheet and Tube Company, Inland Steel Company are between Dickey Road and the lake, so you wouldn't sample --

MR. POOLE: That's right.

CHAIRMAN STEIN: I don't know. Let's check this and I think this is a very clear point.

If the cyanide question is a real question -- and I am certainly not disputing it, I wouldn't after all these years, nor am I disputing Mr. Poole's conclusions on this -- but if we say that "In 1960, the Public Health Service started a comprehensive water quality survey on the Great Lakes-Illinois River Basin," -- and I am quoting I think from Mr. Poston's remarks -- this is the biggest and most thorough investigation ever undertaken in water quality in the country.

The greatest part of the activities of the Great Lakes-Illinois Basin project to this state have been in the Illinois River Basin and Lake Michigan.

The study started in 1960. This is 1965.

Mr. Klassen asked a question on cyanide; Colonel Chesrow asked a question on cyanides, and we'd be glad to say you don't know what happens to the cyanides in the lake?

MR. LE BOSQUET: Well, I might explain.

MR. CHESROW: You sound like you are on our side.

(Laughter.)

CHAIRMAN STEIN: I didn't know that there were any sides to clean water, but if that is your side, I am with you.

MR. LE BOSQUET: Well, in making these studies, I might say in defense of my cohorts, if that is necessary, I think they stand on their own; but normally, we look for things when we have reason to believe there is a problem, and look for things when there is some evidence and this, as Mr. Poole has indicated, we did not feel was a major problem.

MR. CHESROW: There is a variance in the percentages that were quoted.

Don't you think this is a field that the Federal Government should step in or could step in to find out what happens to the cyanides?

MR. LE BOSQUET: I asked our research people if they were willing to come up and indicate -- work on some probing problems that came up before this particular conference, and they said, "Well, that is one of the reasons we are here."

We will have a laboratory in Ann Arbor before too long and this type of thing would be one of their jobs.

MR. CHESROW: Thank you.

CHAIRMAN STEIN: Do we know that happens to the cyanides when there is an ice cover on that lake, Mr. Le Bosquet?

MR. LE BOSQUET: No studies were made of this.

CHAIRMAN STEIN: Do you feel as optimistic about the problem of cyanides with an ice cover as you were without them?

MR. LE BOSQUET: Well, what was the question?

Well, in this case, the wind would not blow it over to the Chicago intake quite so fast, definitely.

(Laughter.)

CHAIRMAN STEIN: Are there any further questions or comments or any aspect of Mr. Le Bosquet's presentation?

If not, thank you very much for a very comprehensive analysis of the situation and we will call on Mr. Poston again.

Mr. Poston.

MR. POSTON: I have asked Mr. W. Q. Kehr, Director of our Great Lakes-Illinois River Basin project to give a brief statement based on project studies as to the long range effect of continued waste discharges into Lake Michigan.

Mr. Kehr.

MR. KEHR: Mr. Poston, conferees, ladies and gentlemen:

In our studies of the Great Lakes, we have considered the long range effect of waste discharges into Lake Michigan.

This problem we consider even more serious than the pollution problem which exists today.

Our projections indicate substantial growth in the metropolitan area and as well a tremendous expansion of industrial activities.

The quantity of wastes now discharged into the lake must inevitably increase.

The impact of these increasing waste loads could be very serious.

There are three physical features of Lake Michigan which greatly interfere with the normal ability of the lake to assimilate wastes.

First, the normal flushing pattern which removes wastes and prevents unduly high concentrations in a stream and in most of the Great Lakes is so small in Lake Michigan as to be practically nonexistent.

This ability to carry wastes out of the lake, if reduced in proportion to size and described in easily understood terms, could be likened to a ten gallon barrel of water into which a bottle of ink has been poured.

The flushing action existing in Lake Michigan with present inflows would be comparable to the problem of trying to dilute the ink in this ten gallons of water by adding one drop of water an hour.

Second, there is a shallow ridge running between Milwaukee and Waukegan which interferes with the deep water circulation in the lake.

In effect, this divides the lake into a northern and a southern basin, the southern basin being that which is under consideration at this conference.

The quantity of inflows from rainfall and runoff is so small in comparison to the great size of the southern basin that there is virtually no tendency for gradual displacement of the water in a northward direction to push pollutants towards the Straits of Mackinac where they will be carried out of the lake.

The effect of this silt is to restrict the mixing of the waters of the southern and northern basin to wind-induced shallow currents which causes flow sometimes in a northerly direction and sometimes in a southerly direction.

We have found no dominant tendency for currents to continuously sweep waters of the southern basin northwardly.

The third of these physical features is the lack of mixing in the lake.

We have found that lake currents are made up of large masses of water which can move for extended periods of time without effective mixing.

Thus, pollutants discharged into such a mass tend to remain concentrated and can move many miles and for as long as several days without being effectively dispersed.

Perhaps the most serious problem facing us is the possibility that the effects of the accumulations of persistent materials may be irreversible in a lake as large as Lake Michigan and into which is consistently being discharged natural pollution; that is, silts, nutrients and chemicals contained in the surface runoff from rainfall.

It is quite likely that once concentrations have reached levels which interfere with water uses, it may not be possible to reduce the contaminants in waste discharges to the level that any significant improvement in the quality of the lake waters can be secured.

The limitations created by these physical characteristics of Lake Michigan are such that we must make variant efforts to reduce it to the lowest possible level both present and future waste discharges into the lake.

Failure to do this will result in gradual impairment of the water quality to the extent that many future water uses will be interfered with or seriously curtailed.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Kehr.

Are there any comments or questions?

We want to thank you very much, sir.

Mr. Poston.

MR. POSTON: As a result of this report, Mr. Le Bosquet has made summaries and conclusions, and I would like to make a statement as to the corrective actions needed.

We would recommend that:

No. 1. The industrial plants in both Indiana and Illinois take immediate steps to improve practices for exclusion or treatment of wastes especially the following constituents; oil and tarry substances; phenolic compounds or other persistent organic chemicals that contribute to taste and odor problems; ammonia and other nitrogenous material; phosphorus; suspended matter, and highly acidic or alkaline materials.

No. 2. Major industrial plants institute permanent programs of sampling their effluents to provide more complete information about waste outputs. Location and frequency of sample collections should be sufficient to yield statistically reliable values of waste output and its variations.

Analyses should include the following: pH, oil, tarry residues, phenolics, ammonia, organic nitrogen, total nitrogen, cyanide, toxic metals, phosphorus, suspended solids and biochemical oxygen demand.

Wastewater flows should be measured and results should be reported in terms of both concentrations and tonnage rates.

Monthly reports of results should be submitted to the appropriate state water pollution control agencies, where they will be available in open files.

Unusual increases in waste output and accidental spills should be reported immediately to the State agency.

Third, appropriate state or local agencies establish a system of water quality monitoring stations at strategic points in the public waters of the area.

Analyses should include the indices recited above, plus dissolved oxygen, coliform and fecal streptococcus counts and stream temperature.

At selected locations and for selected indices, continuously recording monitors should be maintained and daily transmitted to a central receiving office.

Effective loading procedures should be instituted by state or other appropriate agencies, for quickly informing interested parties of sudden changes or hazards to water quality.

The Thomas J. O'Brien Locks should be closed and placed in conventional lockage operation to provide more positive control of flows and reduce the frequency and duration of backflows to Lake Michigan.

No. 5, a dam be built across the Grand Calumet River to prevent uncontrolled flows from Lake

Michigan to the Illinois River through that channel.

Preferred location of the dam is east of the outfall from the East Chicago Municipal Waste Treatment Plant.

At this time, I'd like to add something that I didn't have in the Blue Book but which I would like the conferees to consider during their deliberations here and that would be the placing of a dam or lock control works at the headwaters of Indiana Harbor.

The purpose of this would be to prevent the flow of waste to Lake Michigan.

This could permit, then, the flow to be down to the Grand Calumet River and then to the Cal-Sag Channel.

I think that treatment of the waste would certainly be required in either case, but that this would prevent and could prevent the long term despoiling of our lake and the potential damages to all of our water uses here.

As a sixth recommendation, all municipal wastes in the area receive secondary treatment.

The trend toward consolidation of small community facilities into integrated sewer systems should be accelerated to achieve better operating conditions and reduce the proliferation of sewage treatment plants discharging into small tributaries and dry watercourses.

Hammond and East Chicago investigate the feasibility of constructing lagoons for the further treatment of waste effluents.

Part of the existing poorly-drained flood plain of the Grand Calumet River might be utilized for this purpose, with levees around the lagoon high enough to prevent flooding, and improved bypass channels for storm drainage.

All sanitary wastes be disinfected before discharge. Disinfection should be practiced in the manner prescribed by State Water Pollution Control Agencies and mutually agreed upon between the two states.

This is the summary of our recommendations as a result of our studies and in our report today, and this concludes our presentation.

CHAIRMAN STEIN: Are there any comments or questions from the conferees?

If not, I don't know if you are going to cover this, Mr. Poston, but perhaps the Corps of Engineers -- and I am not sure that I understand your recommendation No. 4, the Thomas J. O'Brien Lock be closed and placed in conventional lockage operation.

Why isn't it closed now?

Would you rather have the Corps answer that when they come up?

MR. POSTON: I think we might point this out now.

The Blue Island Locks which are in use at this time, and control the flow of water down the Cal-Sag, this water coming from Lake Michigan or from the Grand Calumet River are small and the larger locks than the O'Brien Locks have been constructed.

If the O'Brien locks are closed, or open at this time, and if they were closed, it would permit flow to come through Indiana Harbor down to the Grand Calumet and then uncontrolled flow down past the Blue Island Locks.

The Blue Island locks are to be removed so that the O'Brien -- and then, the O'Brien Locks can be used for control purposes.

With the addition of the dam about -- present talk is about a dam at Columbia Avenue which is about the divide there.

I would propose that consideration be given to placing this lock out at the mouth of Indiana Harbor so that all of the wastes could go down instead of going out in our Lake Michigan.

MR. CHESROW: Mr. Chairman?

CHAIRMAN STEIN: Colonel Chesrow.

MR. CHESROW: I believe Colonel Mattina of the Corps of Army Engineers does have a lengthy statement on the operation of the locks.

Now, I'd like to correct one statement. "They are closed to navigation, but have been operational for water control."

We have called upon them a number of times this past year for water control.

From they are "closed" for navigational purposes -- to they are "open" for navigational purposes.

CHAIRMAN STEIN: Do you want to comment or not?

MR. POSTON: Well, all I have to say is that we had flown over the locks at -- the O'Brien Locks, and I am sure that Colonel Mattina could answer this question as to what amount of time --

COL. MATTINA: Let me pick it up in my statement.

MR. POSTON: Okay.

MR. BACON: He will pick it up.

MR. POSTON: He will pick it up.

CHAIRMAN STEIN: Are there any other comments or questions?

MR. CHESROW: I don't think we want to go into the actual spotting of the dam at this time.

CHAIRMAN STEIN: Well, at least, from my point of view, the placement of a dam in any particular place, whether it was here or anywhere else is a very delicate matter that needs very mature consideration.

However, I think the technique we use at the conference is to let the participants, whoever they may be, make their judgment on what is relevant and the conferees will give it such weight as they deem appropriate.

MR. CHESROW: Again, thank you, Mr. Chairman.

CHAIRMAN STEIN: Does that conclude the H.E.W. presentation, Mr. Poston?

MR. POSTON: That concludes our presentation.

CHAIRMAN STEIN: Do you have any other Federal agencies?

MR. POSTON: In line with the regulation --

CHAIRMAN STEIN: Just one moment.

Do you have any more discussion on that?

MR. CHESROW: No, not on that.

CHAIRMAN STEIN: Good.

MR. POSTON: In line with conference procedures, we have asked other Federal agencies having interest in water pollution control to make such statements as they desire that may have a bearing on this.

The Army Corps of Engineers, Colonel John C. Mattina, District Engineer for the U.S. Army District here in Chicago, has indicated that he will make a statement.

Colonel Mattina.

COL. MATTINA: Mr. Chairman, honorable conferees, ladies and gentlemen, I am Colonel John C. Mattina, District Engineer of the Chicago District, Corps of Engineers for civil works responsibility.

The area which we are discussing today, the southern part of Lake Michigan, is part of our responsibility.

This is the reason I am representing the Corps of Engineers.

I appreciate this opportunity to discuss with you the responsibility of the Corps of Engineers on matters affecting water pollution in the Greater Chicago area. I propose to develop the relationship of our activities to the problem of water pollution in two general areas, regulatory and operational.

In the regulatory area, I will enumerate, describe and explain the laws and the administration thereof for the protection of navigable waters; in the operational area, I will discuss aspects thereof that affect or may affect the problem of pollution.

The Corps of Engineers is responsible for the administration of laws for the protection of navigable waters and for the construction, maintenance and operation of improvements authorized by Congress for navigation and flood control, including multiple uses embracing power, water supply, and low river flow augmentation.

The principal laws having a relationship to water pollution in which the Corps is involved are the River and Harbor Act approved 3 March 1899, and to a lesser extent the River and Harbor Act approved 3 March 1905. Section 10 of the 1899 Act provides for the regulation of construction, excavation and filling in navigable waters, and Section 13 of the same Act makes unlawful the deposit of "refuse matter of any kind or description whatever other than that flowing from streets and sewers and passing therefrom in a liquid state . . ." in navigable waters or their tributaries.

Section 4 of the 1905 Act charges the Secretary of the Army with regulation of dumping of "dredgings, earth, garbage and refuse materials of every kind . . ." when necessary in the interest of navigation.

The Oil Pollution Act of 1924 is not applicable to waters in the Great Lakes area, since it concerns only waters in which "the tide ebbs and flows." However, oil discharged from vessels has been held to be refuse matter and, therefore, its discharge into navigable waters of the United States is a violation of

Section 13 of the 1899 Act that I mentioned previously.

In brief therefore, Section 10 of the River and Harbor Act of 3 March 1899 is the law by means of which construction and dredging in waters of the United States are controlled to prevent interference with the navigable capacity thereof.

Section 13 of this same Act is the law available to the Corps of Engineers to control oil pollution and illegal deposits, again in navigable waters or their tributaries, insofar as these acts affect navigation.

The Corps of Engineers' activities in connection with the administration of the laws enacted by Congress for the preservation and protection of the navigable waters of the United States cover the establishment of navigation and bridge regulations, harbor lines, anchorage areas, danger zones, seaplane restricted areas, dumping grounds and fish stake limits; the issuance of permits and approval of bridge plans; and the investigation of obstructions, wrecks, oil pollution and illegal deposits.

Since the primary purpose of these statutes is to protect navigation from obstruction and injury, enforcement has been concentrated on prevention of illegal deposits, including oil, that will impede or adversely affect navigation.

The most serious problem in oil pollution enforcement rests in the difficulty of securing the necessary evidence to warrant prosecution. The large expanses of open water, the isolation of vessels navigating thereon, and the devious and hidden methods of discharging oil make it frequently impossible to ascertain the vessels and persons responsible. Inspections of probable sources of pollution from industrial establishments are made frequently, particularly in areas where violations are common, with a view to keeping the navigable waterways free from oil pollution and obstructive and injurious deposits.

A major source of oil pollution, not curable under existing laws administered by the Corps of Engineers, is the untreated effluent from municipal and industrial sewers. The extent of municipal sewer systems and of the connections thereto render identification of the oil sources a practical impossibility.

The only case in the Chicago District involving illegal deposits which was prosecuted through the courts is that involving the depositing of flue dust and other industrial solids in the Calumet River, Illinois, by three major steel companies. This case resulted in a successful conclusion.

The three steel companies in 1951, and I would like to underscore the date 1951, since it became a long, hard trek, and prior years dredged their waste materials deposited in the Calumet River upon demand by the Corps of Engineers.

However, in 1953, they refused to remove additional deposits which had formed in the river channel when requested by the Corps of Engineers. After prolonged attempts at negotiation and continued refusal by the steel companies, suit was initiated by the Government in the U.S. District Court in 1954 to compel the steel companies to remove the illegal deposits under Sections 13 and 10 of the River and Harbor Act of 3 March 1899 that I have explained previously. The District Court on 24 June 1957 rendered a decree favorable to the Government.

The steel companies appealed the U.S. District Court's decision to the U.S. Court of Appeals for the Seventh Circuit on 7 November 1957. The Court on 22 January 1959 rendered a decision in favor of the steel companies dealing only with the applicability of the 3 March 1899 Act to the case and reversed the decree of the District Court.

In other words, at that time, we found ourselves with no law that we could apply.

The U.S. Department of Justice petitioned the U.S. Supreme Court in April 1959 for a writ of certiorari. The case was argued in January 1960, and on 16 May 1960 the Court rendered a decision reversing the U.S. Court of Appeals on the question of law; that is, upholding the applicability of the law, and remanded the case to it for proceedings and sufficiency of evidence in conformity with the opinion.

In other words, they were told to go ahead and try the case, that the law was applicable.

Defendants petitioned the U.S. Supreme Court for a rehearing which was denied on 6 December 1960.

After oral arguments in the Court of Appeals a decision was rendered affirming the decree as to the prohibitory injunctions but reversing it as to mandatory injunctions and remanding the case to the District Court for a new trial on 17 February 1961.

In other words, we were told that the law was applicable, but we could not, until we proved our case, force the steel companies to do any dredging.

Negotiations between the defendants and the District Engineer were undertaken in 1962 and 1963.

A tentative agreement was reached by which the three steel companies would pay $620,000 to the

United States for removal of existing deposits of flue dust and industrial solids and an annual amount of $25,000 for removal of future deposits. The agreement was approved by the Department of Justice and the Secretary of the Army, and a final decree terminating the litigation was issued by the District Court on 2 August 1963.

Permits were issued by the Department of the Army to the steel companies on 1 August 1963, permitting discharge and deposition of flue dust and industrial solids in the Calumet River and requiring payment of an annual amount of $25,000 for its removal. This payment is to be reduced as the companies decrease their deposition of solids into navigable waters.

The above case is cited to point out the extended period of litigation involved, almost nine years, and the difficulty in interpreting the existing law. Now, we'd like to point out that other steel companies in Cook County, Illinois, and Lake County, Indiana, the area in which we are concerned here are continuing to cooperate with the Corps of Engineers by the removal of their deposits from the Federal channels involved.

In its administration of Section 10 of the River and Harbor Act of 3 March 1899, covering issuance of permits and this is important because most people have contact with us in the Corps on this problem of permits. These permits are for construction of wharves, piers, dolphins, booms, weirs, breakwaters, bulkheads, jetties, or other structures in navigable waters of the United States, the whole consideration of the Corps of Engineers is whether the proposed structures themselves constitute an unreasonable obstruction to navigation.

However, coordination is effected with fish and wildlife agencies whenever, upon consideration of the work proposed under a permit application, it is indicated that the work might have a detrimental effect on fish and wildlife.

Permits involving the construction of outfall sewers from industrial establishments are thoroughly investigated. In cases where it is determined there may be a deposit of solids in navigable waters that may cause an obstruction to navigation, a special condition is now included in the permit making the applicant responsible for removal of the shoal material upon request of the Corps of Engineers.

So much now for regulatory function. I would like to turn now to the operation problems.

With respect to current operations of the

Corps of Engineers in this area, I shall discuss the two structures contained in the Calumet-Sag Project referred to in the Department of Public Health's February 1965 report as well as our dredging activities.

Congress, in the River and Harbor Act of 1946, authorized the Calumet-Sag navigation project. As part of this project there were included a lock and controlling works on the Calumet River and a lock and controlling works on the Grand Calumet River.

The design purposes of these locks and controlling works were threefold: maintenance of a lower water surface elevation landward thereof, thereby minimizing bridge alterations; in other words, we want to maintain a 25-foot vertical clearance between the water surface and the bridges now being built on the Cal-Sag; control of diversion from Lake Michigan; and reduction of pollution into Lake Michigan.

At present, diversion of flow from Lake Michigan through the Calumet, Little Calumet and Grand Calumet Rivers is controlled by the non-Federal Blue Island lock at the easterly end of the Calumet-Sag Channel. This lock is owned and operated by the Metropolitan Sanitary District of Greater Chicago. Since the Blue Island lock is only 50 feet wide, it does not permit navigation to take advantage of the widened channels in the Calumet-Sag project.

The Cal-Sag channels are being widened to 225 feet. The current width of the channel is only 60 feet.

The Blue Island lock is one of the two 50-foot restrictions. As the result, with the continued existence of the 50-foot lock there, the new chemical and oil barges that are built to 50 foot and 52 foot width specifications cannot be used to go through the Cal-Sag project.

It is for that reason now, and this is a navigation reason, that we are concerned with the early removal of the Blue Island lock.

Now, provision of the locks and controlling works on the Calumet and Grand Calumet Rivers would permit the removal of the obstructive Blue Island lock and would permit the achievement of the aforementioned design purposes.

To date, the lock and controlling works on the Calumet River have been completed and are known as the Thomas J. O'Brien Lock and Controlling Works.

Normally, simply, the Thomas J. O'Brien Lock, because of lack of local interest in the project at this time, it appears unlikely that the Grand Calumet River improvements which is considered as Part 2 of the

Cal-Sag project including the proposed locks and controlling works will be provided in the near future.

Thus, some substitute control in the Grand Calumet River is needed to permit completion of the first part of the Calumet-Sag navigation project, and when the Federal Government is expending almost $85 million for the improvement of the Cal-Sag Channel, naturally, we would like to see some results from the money being expended as soon as possible.

Now, such control that I have referred to would take the form of a simple barrier dam which would restrain flow from Lake Michigan into the westerly portion of the Grand Calumet River.

The location of the barrier dam has been the subject of recent discussions with numerous agencies. These agencies include the U.S. Public Health Service, our host today, the Indiana Stream Pollution Control Board, the Indiana Flood Control and Water Resources Commission, the Illinois Division of Waterways, the Illinois Sanitary Water Board, the Metropolitan Sanitary District of Greater Chicago, the City of Chicago and the City of Hammond.

Several alternative sites are being considered for the location of the barrier dam. The selection of the site will ultimately be based upon these factors.

One, the needs of navigation which, of course, is to provide a barrier dam.

Two, the effect upon other water uses and there are several; the desires of local interests and the availability of right of way for the facility.

It is expected that the barrier dam can be completed in fiscal year 1966; that is, the Federal fiscal year beginning 1 July 1965 and ending 30 June 1966, probably the latter portion of the fiscal year.

This will permit removal of the Blue Island lock and the operation of the Thomas J. O'Brien lock and controlling works for navigation purposes.

Now, by mutual agreement, the O'Brien lock and controlling works and the barrier dam, will be operated, insofar as flows from and to Lake Michigan are concerned, that is, for non-navigation purposes, in accordance with the request of the Metropolitan Sanitary District of Greater Chicago and under the general supervision of the Chicago District Engineer.

The barrier dam across the Grand Calumet, as now envisioned, will consist of a single row of steel sheet piling with a spillway section. The top of the dam will be seven feet above the Chicago City datum. It will not be an enormous structure, I assure you.

The spillway section will be a steel panel three feet high and 18.5 feet long, constructed so that it can be raised or lowered by a manually operated screw type life mechanism.

During dry weather periods, the spillway section will be kept closed. During periods of heavy runoff, in the Grand Calumet River, the spillway section will be opened at the request of the City of Hammond and coordinated with the Metropolitan Sanitary District of Greater Chicago in order to permit a temporary flow toward Lake Michigan through the Indiana Harbor Canal.

Now, let us turn our attention to the Thomas J. O'Brien lock. This lock is not now fully manned for lockage of navigation, and it is intended to continue this status until the removal of the Blue Island lock.

However, sufficient crew has been assigned to this location to manipulate the various appurtenances as required to control river flows.

Since 17 January 1965, at the request of the Metropolitan Sanitary District of Greater Chicago, the lock gates and sluice gates in the control works were closed on 12 occasions for various periods of time in order to stop the lakeward flow of the Calumet River through the lock in order to reduce pollution of Lake Michigan at Calumet Harbor.

These closures were occasioned by southerly winds which lowered the water surface at the southern end of Lake Michigan, inducing the Calumet River to flow lakeward.

It is understood that the Metropolitan Sanitary District of Greater Chicago plans to request the closing of the gates and valves of this lock whenever warranted in order to prevent insofar as possible, further pollution of Lake Michigan.

In summary, therefore, insofar as the Thomas J. O'Brien lock is concerned, although we are not manned to operate it for navigation purposes, there is no need to so man that particular lock as long as the Blue Island lock is there; however, we have sufficient crew that we can close it or open it at the request of the Metropolitan Sanitary District to control flow of water toward Lake Michigan.

Now, the Corps of Engineers in this area also has another major civil works responsibility; and that is for dredging, and of course, if the waters are polluted, so too are the materials being dredged from the rivers and the harbors.

Our dredging contracts in the Chicago,

Illinois and Indiana Harbor area; and that is, the area that we are concerned with today, requiring disposal of the excavated material in deep water in Lake Michigan specifies that the material be transported and deposited in the authorized dumping ground approved by the Secretary of War in 1924.

This dumping ground complies with the following laws: The Act of Congress, approved 23 June 1910, which makes it unlawful to dump or deposit refuse matter of any kind or description whatever, other than that flowing from streets and sewers and passing therefrom in a liquid state, in Lake Michigan at any point opposite or in front of Cook County, Illinois, or Lake County, Indiana, within eight miles from the shore of said lake, unless said material is placed inside of and is retained by a breakwater; certain regulations for the control of navigation in Chicago Harbor, and I am referring to the Harbor where navigation -- where Navy Pier is located.

I will repeat again: Certain regulations for the control of navigation in Chicago Harbor, particularly Section 38-8, Befouling Public Waters, of the Municipal Code of Chicago, which prohibits the deposit of materials in Lake Michigan within ten miles of the corporate limits, the corporate limits are three miles from the shoreline.

Therefore, our dredged materials have to be transported at least 13 miles from the shore and this law, too, prohibits the towing of loaded dump scows, that is, within the harbor unless a City of Chicago inspector is on board at the time of towing.

These laws we comply with and enforce both in our contract work and such dredging as may be accomplished with Corps of Engineers' plant.

This is what makes dredging operations in the Greater Chicago area much more expensive than other parts of the country, but we comply with them as a necessity for the health of our community.

The foregoing presents broadly Corps of Engineers activities in this immediate area, particularly those which are considered to have a relationship to water pollution.

The importance of preserving and improving the quality of our water resources is, we all agree, unquestioned.

Within the framework of the laws and regulations governing our activities, we shall continue to take such actions which are feasible and possible to improve or protect water quality.

We stand ready to cooperate wholeheartedly with other Federal, state and local agencies dealing with this problem.

Thank you very much.

CHAIRMAN STEIN: Thank you, Colonel Mattina.

Are there any comments or questions?

MR. POSTON: I noted at the top of page ten that the gates were closed on the O'Brien locks on 12 different occasions since mid-January which is about a month and a half.

This means that had the gate not been closed, then, 12 times during the month-and-a-half period there would have been flow backwards to the lake?

COL. MATTINA: Very definitely.

MR. POSTON: This would carry back from the Calumet Sewage Plant effluent back to the lake, then, possibly?

COL. MATTINA: That is true.

MR. POSTON: Thank you.

MR. POOLE: Could I assume, Colonel, that during those 12 times there was flow between the O'Brien locks and the lake backward to the lake?

COL. MATTINA: There would have been.

MR. POOLE: Well, anything that came in --

COL. MATTINA: You mean from the O'Brien lock in the Calumet River itself?

MR. POOLE: Yes, back to the lake.

COL. MATTINA: Yes, there was.

MR. POOLE: Thank you.

CHAIRMAN STEIN: Panel?

MR. CHESROW: Colonel Mattina, I'd like you to comment on Mr. Poston's suggestion and recommendation with reference to the dam to be built.

COL. MATTINA: Oh, is this the control --

MR. CHESROW: Yes.

COL. MATTINA: -- the control dam?

There has been no decision reached. There are several locations: One, of course, is the Public Health location now which will include the effluent from East Chicago as well as Hammond.

There is another one that will include only Hammond and another one that will exclude both East Chicago and Hammond and be built -- oh, somewhere on the divide there.

No decision has been reached on that, Colonel Chesrow.

MR. CHESROW: Yes. Now, one other question with reference to the dam at Indiana Harbor that was injected in this afternoon.

COL. MATTINA: I know there was some thinking in that respect.

Since it is our responsibility for navigation, this would not be a navigation lock at all. I mean, actually, it would have to be approved for other than navigational purposes.

If I have any feeling of navigation interest, of course, they would resist having a lock and control works there at the head of navigation at Indiana Harbor because of the normal interference that there would be.

But it is not impossible. This is something that, perhaps, should be given study from a public health point of view. However, I think the important thing is to get everybody to clean up that pollution as fast as they can, rather than to try to see if we can stop it, or at least open that bulkhead in the form of a lock and control works which won't be completely safe.

MR. CHESROW: Thank you.

CHAIRMAN STEIN: Any more questions?

Thank you, Mr. Poston, do you have any other presentations?

MR. POSTON: The U.S. Department of Commerce has asked to be heard today and Mr. K. L. Kollar will make a statement for the Department of Commerce.

Mr. Kollar.

MR. KOLLAR: Mr. Chairman, conferees, ladies and gentlemen, I am K. L. Kollar, Director of the Water Industries and Engineering Services Division, Business and Defense Services Administration, Department of Commerce.

Off the record, that is quite a mouthful and I have cut it down some.

The Department of Commerce has spearheaded a nationwide drive to modernize U.S. industry over the past two years. Briefly, the purpose of this drive is to improve our competitive position in the emerging one-world market, and to increase our rate of economic growth.

It is not necessary to present Department of Commerce statistics which indicate that our economy is strong. Nor is it necessary to show that we cannot stand still. We must continue to increase productivity, lower costs, decrease unemployment, and increase consumer buying if we wish to compete profitably in today's and tomorrow's market and leave the same legacy of opportunity for our children and grandchildren. Part of the answer rests in modernization.

Certainly this Administration has provided incentives and laid the groundwork for greatly increased.

economic activity with the $11.5 billion tax cut, the liberalized depreciation regulations, and the investment tax credits. These measures have been instrumental in pumping more cash into corporate coffers for expansion and modernization.

The Government can only set the stage while business initiative, ingenuity, and enterprise, powerfully stimulated by the profit motive, are always the factors most responsible for our economic growth.

Modernization generally brings to mind plant production equipment and the associated economic benefits in addition to finance and research development. One of the most important benefits could be the effect on water.

The Department of Commerce would like to emphasize to this Conference that great water pollution benefits can accrue from modernization. Modernization could decrease water use by conservation, recirculation, reuse, multiple use, and stepped-up use, while water pollution could be decreased by reclaiming wastes and preventing leakage and spills.

Pollution need not always be controlled by treatment. It could involve diligent process control, employee education, and recovery systems which in a way are part of modernization. Companies spend money to study and survey efficiency of organization, operation and production. Considerable savings can be effected from surveys of in-plant water use and sources of pollution for the purpose of minimizing both. Time does not permit recounting cases where companies acting on their own initiative and with an eye to the future, have developed programs which will create very few problems to the enforcement of water pollution control laws.

This short presentation so far has emphasized the industrial aspects of water pollution because the Department of Commerce has the responsibility of assisting and advising businessmen and acting as liaison between business and Government.

Industry has already invested hundreds of millions of dollars on control and abatement facilities. These investments support the objective of President Johnson's message to Congress on the national beauty of our county in which he charged municipalities as well as industry, and I quote:

> "To organize for action and rebuild and reclaim the beauty we inherited."

It is therefore encumbent on all local governments and industries to continue working hand in hand to solve pollution problems where they exist.

CHAIRMAN STEIN: Thank you, Mr. Kollar.

Are there any comments or questions?

If not, thank you very much for your statement.

Mr. Poston.

MR. POSTON: The Department of Interior has asked to be heard, but Mr. H. C. Jordahl, Jr., who was to make this statement requested that his presentation be made first thing Wednesday morning, tomorrow morning, March 3rd. Would that be satisfactory?

CHAIRMAN STEIN: Without objection, we will try to do that.

MR. POSTON: This is the end of the Federal presentation.

CHAIRMAN STEIN: Thank you, Mr. Poston.

Are there any comments or questions on the whole presentation now?

If not, I'd like to indicate a few things.

One, if anyone else has a presentation and has slides, please see the projectionist so he can make arrangements to make you slides.

Secondly, I would like to indicate some of the ground rules here. Under the Federal law, the Federal Government and the states are the conferees. The invitees here within the jurisdiction of the Federal

Government to invite are the ones you see at the table, and the ones who have been called up, plus the Department of Interior tomorrow.

We are one Government, and we invite other people if the need is established.

Other than that, we have asked that the state agencies concerned with pollution from industry in Illinois. They in turn, are authorized to have anyone else participate if they wish.

Now -- and this is just to clear this up so you will understand the extent of our jurisdiction here, and the balance that the Congress decided to have in the Federal-state relationship.

At this stage of the proceedings, our relationship is with the states and the states have the right to invite anyone within their states to participate.

Our schedule at the present time will very shortly call for a ten-minute recess.

We will reconvene and go to about five o'clock.

There are some agendas in the back of the room to give you an idea of who may be coming up. You have to understand that the agendas are just for the guide of the conferees. The agendas are for our assistance and from time to time, adjustments are made in the agendas to fit the schedule of the people who come here to make statements.

At this time, we will stand adjourned or recess for ten minutes and reconvene after that until about five.

(Whereupon, a recess was had.)

CHAIRMAN STEIN: May we reconvene?

Mr. Klassen.

MR. KLASSEN: There has been a number of references to the multipurpose use of the water in the south end of Lake Michigan and the tributary waters. One of those uses that is of extreme importance, of course, is recreation.

From the State of Illinois standpoint, any questions of legal, political, financial differences, all must be secondary to the one overriding objective and that is to clean up the lake and the streams so that they will be free from pollution and will be suitable for the various multipurpose uses.

It has been said that nobody likes to talk about sewage, much less their own; but, however, this is a factual conference.

It is necessary, sometimes, that we talk about the pollution that originates in our own area. This will be done.

We want to start off this afternoon, however, with some facts on one of the extremely important uses of water in Lake Michigan, particularly, and this is recreation.

The Chicago Park District has been long noted for its operation of a number of very excellent beaches. Chicago always has been proud of the fact that its beaches have been used and have been suitable for use.

The effect of pollution on the quality of the water to Chicago's southside beaches, particularly, comes into sharp focus in this conference, and the first presentation for Illinois will be in that vein.

It will be given both by Dr. Gerald P. Atlas, Director of Medical Services, and Glenn W. Metcalfe, Supervisor of Sanitation.

Dr. Atlas.

DR. ATLAS: Mr. Chairman, honorable conferees, ladies and gentlemen, I am Dr. Gerald Atlas, and in my official capacity, I serve as the Director of Medical Services for the Chicago Park District.

The Chicago Park District Beach sampling program started in 1949 as a result of the recommendation of the tri-state survey committee on bathing water quality in the Great Lakes conducted by the United States

Public Health Service.

There were 17 original beach sampling points in this program and this number has varied through the years to its present schedule.

The rate of sampling was determined by economics and also varied as the need arose.

At present, we have 32 beach sampling points.

The people of the City of Chicago take great pride in its lakefront water facilities, and the Chicago Park District is charged with the responsibility of insuring the safety of these facilities under its jurisdiction.

Chicago is one of the few cities on the Great Lakes that has relatively uncontaminated water for recreational use. It is our goal to continue to provide the use of this natural recreational facility to the people of Chicago and if this goal is to be achieved, it is necessary to remove the source of contamination from the southernmost portion of our lakefront.

Now, if I may, I would like to introduce Glenn Metcalfe, our Supervisor of Sanitation, who will demonstrate to you in graphic form the results of a ten-year compilation of sampling data.

Mr. Metcalfe.

MR. METCALFE: Samples collected or analyzed for coliform organisms, fecal streptococcus organisms and total bacteria present according to the procedures and recommendations and standard methods for the examination of water, the American Public Health Association, the ten year sampling period from 1955 to 1964 was used to illustrate graphically these sampling results for coliform organisms.

The coliform most probable number was determined by using 533 dilutions of ten milliliters, one milliliter, a tenth milliliter, a hundredth milliliter, a thousandth milliliter, portions of a hundredth milliliter sample, and for those of you who have copies of our report, we can go into it and start with graph No. 1.

Graph No. 1 illustrates on semi-logarithmic graph paper the averages at 29 beach sampling points and you can see from Juneway Terrace on this to Rainbow Beach, south sampling point, we have a fairly average trend.

When we go to Calumet Beach, the trend starts to rise, and to illustrate this further, graph No. 2, the same coliform averages on standard graph paper, using 1,000 coliform MPN index to the inch.

So we can go to graph No. 2 and you see

what happens when you use it on standard graph paper.

Hammond Beach --

CHAIRMAN STEIN: Mr. Metcalfe?

MR. METCALFE: Sir?

CHAIRMAN STEIN: This is very dramatic and I appreciate the point, but I'd like to come to an accommodation with you on your reproduction of this in the record.

(Laughter.)

MR. METCALFE: You don't know the problem that was involved.

CHAIRMAN STEIN: I can very well know the problem involved. I am intimately concerned with it. However, you have to recognize that while your problem is really involved, we have a joint committee on printing, and we also have a bureaucratic organization of over 80,000 people, and this is the hardest thing to get set up.

(Laughter.)

We are going to have to either reduce your charts or make adjustments and have a rather severe limitation on the kind of folding charts we will have in the printed record. If that meets with your approval --

MR. METCALFE: Well, what you will have to do then is revert to such as graph No. 1, using the semi-logarithmic graph.

CHAIRMAN STEIN: Yes. Thank you.

MR. METCALFE: Again --

MR. KLASSEN: Mr. Metcalfe, if you would speak in more legal terms, my attorney friend here -- you have got to overlook this. This is a lawyer's interpretation of a graph.

(Laughter.)

MR. METCALFE: So then, we go to graph No. 3 and we start at the 49th Street Beach sampling point.

As you can see, 49th Street Beach sampling is fairly good. It is one of the finest beaches that we have in the City of Chicago. It is stable for this period of ten years.

Then, we go to graph No. 4 which is 57th Street Beach, going a little further south.

As you can see, we start showing a little trend.

Then, we go to graph No. 5 at Jackson Park Beach sampling point, and the trend,you can see, is starting to go upward.

Now, we have graph No. 6 which is Rainbow Beach, north sampling point, and at Rainbow Beach, north sampling point, as you notice, we had what is considered a slug of contamination twice in the year of 1961.

On June 30th, the sampling shows what the graph looks like with the dotted lines, and with the August 4th sampling, it shows you what it looks like with dotted lines, and eliminating these two samples, it shows you that there is a steady average there going upward.

The same with Rainbow Beach south sampling point, only I included these two samples of June 30th and August 14th in this, and showing the dotted lines as being eliminated, but as you notice at Rainbow Beach south sampling point, the trend.

Then, we get into the graph No. 8, and starting with graph No. 8, we can go back to using semi-logarithmic and standard paper using the 1,000 coliform average to the inch.

Mr. Stein will probably say we have a problem there, too.

So in the period of 1955 to 1964 on graph No. 8, semi-logarithmic paper, but then on graph No. 8, it goes to the standard paper, and it shows how the trend is rising.

In the year 1959 we had an average of over 12,000 coliform for the summer and on 9-8 that breaks down all the samples collected during the summer of 1959, and it shows you that in this graph, the samples are up and down.

The contamination is there, but it is not general, and you can see that.

Then, we go to the Calumet Beach north sampling point. This, the same thing occurs, on graph No. 10 which shows on semi-logarithmic paper which converts to graph No. 11 on standard graph paper that we have a summer of 1958 and 1959 that the coliform MPN was high.

And on 11-A, 11-B, and 11-C, we break down 1958, 1959 and 1963, and it shows again that the contamination is not general.

Then, graph No. 12 is on semi-logarithmic paper showing the Calumet Beach south sampling point which when you go to graph No. 13 on standard graph paper shows the flexibility and variability of your coliform index.

For the year 1959, and on 13-A, B and C, is the breakdown of these individual years of high coliform density in 1957, '58 and '59.

Again, a sampling shows it goes up and it comes down.

Then, we also sampled Hammond Beach which is graph No. 14, which is on your semi-logarithmic paper.

(Laughter.)

Then, we converted to the standard graph that extends out 88 inches long.

(Laughter.)

It is rather dramatic, isn't it?

Then, we have the last sampling point which is Whiting Beach and Whiting Beach on graph No. 16, using semi-logarithmic paper shows you the variability there, too, which, converted to standard graph paper isn't quite as bad as Hammond Beach, but you can see that this extends 53 inches.

So I don't know how they will be able to get this into booklet form, but if they have to, they can use the semi-logarithmic graph for that purpose.

CHAIRMAN STEIN: Let me go off the record here.

(Discussion omitted from the record.)

All right, on the record again.

MR. METCALFE: That is the presentation of the Park District for this committee.

CHAIRMAN STEIN: Okay. Thank you, Mr. Metcalfe.

Are there any questions or comments?

MR. POOLE: There are.

CHAIRMAN STEIN: Mr. Poole:

MR. POOLE: You went through these graphs and I went through them very hurriedly. You studied them in advance and we just got them, but my inspection indicates that in about 1959, it was your high year as far as all these southernmost beaches were concerned, and I am looking now at the Calumet Beach south and the curve goes down materially after 1959.

Have you got any explanation for that?

MR. METCALFE: No, we don't have any explanation except that I hope the thing is improving.

MR. POOLE: Well, the point I want to make was the graphs certainly do not indicate that since 1906 it had been deteriorating, do they?

If you look at your graph --

MR. METCALFE: I know what you mean, Ed.

MR. POOLE: It looked to me, as I said, I went through them very hurriedly, but it did look like '58 and '59 were your high years and admittedly they are still high.

MR. METCALFE: That's right, that's right, admittedly they are still high.

MR. POOLE: But all of the later graphs do indicate a trend that it has dropped down. I don't know that it is still going down, but it may have leveled off a little bit, anyway.

MR. METCALFE: We will find out a little more about it this summer.

MR. POOLE: It will be interesting to see what your

'65 results are.

MR. METCALFE: See, I am not looking for dirty water. I am looking for clean water, and any improvement makes us happy.

MR. KLASSEN: Mr. Metcalfe, was there any correlation that you found between wind direction and your results, and also between bathing load and your results?

Were these taken into consideration?

MR. METCALFE: Bathing load apparently does not have too much effect on the coliform, but your wind directions do, and your turbulence of the lake does.

Rough days,you will get 50 percent of your 110,000 coliform count and it seems like 50 percent of the time the wind is from the south. So that is the way it roughly breaks down.

MR. KLASSEN: Also, I think this is probably a followup to Mr. Poole's question.

How would you summarize the trend or isn't there any conclusive trend that you see? Are things getting better and if so how much better and how fast?

MR. METCALFE: Well, 1964 was a fairly good year for the bacterial samplings, and this I attribute to being a fairly cool summer. The entire month of August was a cool month.

MR. KLASSEN: This is not in the form of a question, but just a comment.

It looks like with all of the technical experts that are here and particularly the laboratory people, you probably can come up with a new bathing beach index, something that you have been looking for and this is inches of paper per graph

MR. METCALFE: Inches of coliform.

(Laughter.)

MR. POOLE: I have one more question, Mr. Chairman.

CHAIRMAN STEIN: Mr. Poole, yes.

MR. POOLE: Have you any correlation between the incidence of disease or difficulties with the bathers in the southerly beaches compared to the beaches on the north side of Chicago?

MR. METCALFE: No, we have no correlation of that.

MR. POOLE: In other words, it is the same story we found back when the '48 survey was started?

MR. METCALFE: Was started, yes, when that was taking place.

MR. POSTON: At what level of coliform would you close the beach or would you close the beach?

MR. METCALFE: Dr. Atlas.

MR. POOLE: This I have been looking at for years.

DR. ATLAS: I can see that there is no specific level at which we would close a beach unless there was a general and consistent contamination as revealed by successive samples.

As you can see by these graphs, there is an intermittency of contamination that we find on the beaches. We have gone into conference many times. In fact, Calumet-Outer has been closed for a number of years.

The decision to open it is based upon the consistency of sampling. One day, as you can see by the graph, we will get high counts. The next day, it will show a falling index and it will fall even further and then go up the day after.

You must realize that this is sampling that is done according to the standard methods, and when we get a negative sample, we achieve the results much faster than if we get a positive sample.

Many times, after the confirmation of a sample, and we have resampled it, it will prove negative, bacterialogically and by that time the horse is already out of the barn.

As a result, we can only base the decision upon persistent contamination. Other than that, I don't think there is any rule of thumb that one might follow.

MR. KLASSEN: Do you make any analyses except coliform, Dr. Atlas?

DR. ATLAS: Yes, we try to get the strep, et cetera.

These graphs are very dramatically involved as to the southern end of our beaches.

The northern portion, we feel, is good water and healthy water.

The southern portion causes us intermittent concern and concern on the very questions that were asked here, when do we close, when do we open.

And we have just gone by the rule of consistency and general contamination.

MR. POSTON: Have you ever considered a practice of treatment such as chlorination of the water in the lake to reduce this number?

DR. ATLAS: We have considered it, however, our engineers have advised us that it is not a practical or economical method of achieving this goal.

CHAIRMAN STEIN: Are there any further comments or questions?

If not, we have carefully reviewed the list of the people who may have wished to speak today.

We have also taken an informal poll of the conferees up here and we sense that we are pretty close to the saturation point, and I think we get this from the audience, too.

With that, we will stand, I think, recessed until 9:30 tomorrow morning.

(Whereupon, the Conference in above-entitled matter was continued until March 3, 1965, at 9:30 o'clock a.m.)